FORESTRY ABSTRACTS

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NOTES ON PROGRESS IN FOREST SCIENCE

PART II

LOGGING AND TRANSPORT

Tree-length and full-tree logging. The trend towards complete mechanization, employing more powerful and more versatile logging equipment continues, now not only in the U.S.S.R., where tree-length logging (extraction of boles in one piece) is already extensively practised, and in N. America, where numerous trials have already been made [e.g. *F.A.* 19 Nos. 1816–7; 21 Nos. 4471, 4473–4], but also in Germany [*F.A.* 19 Nos. 1797–8, 3058; 21 No. 548]. There is general agreement that tree-length logging can be economic, given the correct equipment and personnel, and studies in the U.S.A. [*F.A.* 20 No. 3243] show that even in selective logging, damage to the residual stand remains well within tolerable limits. In the U.S.S.R. there is a growing tendency—on the grounds of efficiency and economy—to use heavy lorries and crawler tractors, often carrying self-loading devices, for direct extraction of tree-length logs for quite considerable hauls (in some cases up to 17 km.), i.e. from stump to railway or river launching point in one operation [*F.A.* 21 Nos. 559, 3239].

The harvesting of whole trees, i.e. complete with crown, is becoming common practice, at least in the U.S.S.R. [e.g. *F.A.* 19 No. 4259]. The usual method is to skid the trees in bundles, either on a cable behind the tractor, or with the butts or the tops on the rear shield-plate of a conventional logging tractor, and the other end on the ground. However, specialized machinery for harvesting whole trees is being actively developed by both the capitalist [*F.A.* 20 No. 1888; 21 No. 4472] and communist worlds [*F.A.* 19 Nos. 1796, 4280; 20 Nos. 554, 1889; 21 Nos. 3237, 4469]. The Soviet multi-purpose timber-harvesters are still in the experimental and development stages, but the trend appears to be towards machines that will utilize the potential energy contained in the standing tree by felling it directly on to specially designed harvesting machines (based on heavy tractors with or without trailers) for extraction. Such a machine will move about the felling area, felling and simultaneously loading trees until its full load is secured. This is then removed from the site without the trees touching the ground at any time. Advantages claimed include speed of operation; reduced damage to the forest floor, the timber, and regeneration; and lower labour requirement. However, warning voices have been raised in the U.S.S.R. [e.g. *F.A.* 21 No. 4235] and elsewhere, about the amount of the crown that is broken off and left on the site, the damage to regeneration, and the unnecessary and potentially dangerous removal of nutrients from the site, involved in full-tree logging.

Following these developments to their logical conclusion, the final stage in full-tree logging would seem to be the harvesting of trees complete with crown *and* roots. This has, indeed, been done in successful trials in Karelia (U.S.S.R.) [*F.A.* 21 No. 4468] with the object of harvesting the valuable resinous stump- and rootwood. The trees (mixed Pine and Spruce, 160–180 years old) were pulled out of the ground by tractor and cable, bunched, and skidded to the lorry road to be transported, still intact, to the mill.

The handling and transport of timber in mountainous regions. Wire-mesh chutes are being tried for extracting pulpwood billets in Victoria in otherwise inaccessible country [*F.A.* 21 No. 545] and motor tricycles drawing trailers in the Tyrol [*F.A.* 19 No. 3083], but, as indicated by the proportion of papers in a publication of an FAO Joint Committee on Working Techniques [*F.A.* 19 No. 1812], timber extraction in mountainous regions everywhere is increasingly being effected by skyline cable systems.

Russian installations of various types, capable of taking loads up to 3 tons, and/or working over distances up to 3 km., are reported [*F.A.* 19 Nos. 1818, 3067; 20 No. 596]. According to Lloyd [*F.A.* 21 No. 1879], load capacities greater than these are required for heavy tropical hardwoods, and new skyline installations conveying loads up to 5 tons or more are coming into use.

American experimentation with skyline installations continues [e.g. *F.A.* 20 No. 4657], the most impressive recent development—which, it is thought, will go far towards solving the problem of harvesting in rugged terrain—being a radio-controlled logging system [*F.A.* 21 No. 3223]. In this, the carriage incorporates a diesel engine, a torque converter and a small winch for the logging (haul-up) line. The winch action is radio-controlled from the ground, and the speed and position of the carriage are controlled by a snubbing donkey. This system has successfully yarded logs for a distance of 5000 ft., and the tackle can take loads of 35,000 lb. (> 15 tons). Another ingenious development in controlling skyline carriages is reported from Europe [*F.A.* 21 No. 553].

Increasing interest is being shown in the possibilities of helicopter logging. The small pay-load continues to be the chief limiting factor, and Hartgerink [*F.A.* 21 No. 1893], from only one day's trials, considered that transport of pulpwood by helicopter would remain uneconomic in the foreseeable future. Other Canadian and American experts, looking to the increased pay-loads of the new twin-jet models, seem rather more optimistic [*F.A.* 20 Nos. 1899, 4684]. Shaw, on 1956 performance figures [*F.A.* 20 No. 4683], considered heliocopter logging quite uneconomic in Scotland, but later left the question open [*F.A.* 21 No. 1892]. Recent Soviet helicopter logging trials [*F.A.* 21 No. 4459] gave results generally similar to those obtained in Scotland and N. America. Total transport costs by helicopter were 2 to 6 times those of conventional ground extraction methods, but the experimenters outline conditions where helicopters could be a practicable proposition. They consider that, for logging, helicopters should be able to take loads of 8–10 tons, and are best for transport distances of 3–8 km. The Sikorsky Crane model [*F.A.* 21 No. 3242] carries loads of 4–6 tons for distances up to 100 miles; it is the load, not the carry that constitutes the present deficiency. In sum, the general verdict to date on helicopters for logging seems to be 'not proven'.

The ultimate in timber extraction in difficult terrain would seem to be the method of buoyed cable logging worked out in detail—but not in practice—by Sugden [*F.A.* 21 No. 1882]. This envisages a large balloon capable of supporting a 75-ton load, anchored 750 ft. above the ground by 12 cables each 3400 ft. long. A set of 12 electric winches on a platform slung under the balloon are able to haul log loads up from the felling area on one side and pay them down the other to a suitable landing. A more prosaic but novel solution to the problem of transporting produce from forest to mill is also propounded from Canada [*F.A.* 21 No. 4481], where pulpwood chips have been successfully conveyed on an experimental scale by pipeline in slurry-like mixtures (30% chips, 70% water). Pipe-line transport for at least 75 miles is considered economically feasible under certain conditions.

FOREST ENGINEERING

Forest road construction. Much has been written, particularly in Germany [*F.A.* 19 No. 1844; 20 Nos. 624–5, 1905; 21 Nos. 4499–500], but no startling developments can be recorded in forest road construction during the period under review. A general trend, however, is apparent towards the use of better and more specialized machinery for road construction; an example of this is the vibrating type of compactor now being tried on earth and gravel in Germany [*F.A.* 19 No. 523], and also, with other types of compacting equipment, on snow in Scandinavia [*F.A.* 19 No. 3093; 21 Nos. 3249, 4503].

Stabilization of earth roads is being effected in many countries and with many different materials—e.g. lime [*F.A.* 20 No. 4700; 21 No. 579], tar and bituminous binders [*F.A.* 19 No. 4321; 20 Nos. 4702–3; 21 No. 4500], cement [*F.A.* 20 No. 4701; 21 Nos. 578, 3250], and furfural/aniline [*F.A.* 21 No. 578]. A lignin derivative, lignin sulphonate, has been found both to lay the dust on logging roads and produce a semi-permanent 'plastic' road surface that lasts a whole season [*F.A.* 21 No. 1907]. A method of spraying a mixture of mulch and bituminous emulsion, with seed and fertilizers in aqueous suspension, has also been evolved in America, Australia, etc. for the revegetation of denuded soil on embankments and cuttings [*F.A.* 20 No. 624].

In the U.S.S.R., where large quantities of timber may have to be transported long distances by lorry along a single road over wet ground, day in and day out for a period of years, roads are being made of large, perforated, reinforced-concrete slabs (2·5 × 1 × 0·16 m., weighing 0·7 tons each, or even larger) laid in two continuous parallel strips spaced to correspond with the track widths of the vehicles used [*F.A.* 19 Nos. 4317–8]. Such concrete tracks appear to have proved their value, at any rate in regions where gravel supplies are scarce [*F.A.* 21 No. 4501]. Various designs of heavy-duty, wood-and-earth extraction roads are also being tested in the U.S.S.R. [*F.A.* 19 Nos. 4316, 4320; 21 No. 1906]. The construction and maintenance of snow and ice roads for the transport of heavy timber loads in winter is becoming increasingly mechanized [e.g. *F.A.* 20 Nos. 1907 (U.S.S.R.), 3269 (Norway)].

NOMENCLATURE OF TIMBERS

Contributions to the standardization of timber names have continued to appear, and discussions of nomenclature have formed part of studies of such species or groups as Limba [*F.A.* 20 No. 4244], Red Mahogany (*Eucalyptus* spp.) [*F.A.* 21 No. 2276], true Mahogany [*F.A.* 21 No. 4845], the Brazilian 'Caixeta' and 'Cabriuva' [*F.A.* 20 Nos. 3645–6] and Satinwoods [*F.A.* 21 No. 3645].

Recent publications include nomenclatures of woods from Africa [*F.A.* 18 No. 4500; 19 No. 3379; 20 Nos. 929, 3644, 3795; 21 No. 3646]; native timbers of Brazil (a revision) [*F.A.* 19 No. 4712]; timbers of the S. Asia/Pacific region as a whole [*F.A.* 20 No. 3643]; Siam [*F.A.* 19 No. 3369; 20 No. 3642]; India [*F.A.* 21 No. 4839], and Timor [*F.A.* 18 No. 4501; 21 No. 898]. Russian and Czech work giving trade names used for timbers from Vietnam has also appeared [*F.A.* 21 Nos. 3656–7].

WOOD ANATOMY (HISTOLOGY)

Systematics. Critical studies of the wood histology of families and other botanical groups and their relationships continue to appear [*F.A.* 19 Nos. 2251–2, 4735, 4763; 20 Nos. 3657, 3660–2; 21 No. 915].

A key to the Japanese Fagaceae, based on wood-anatomical characteristics, has been published [*F.A.* 21 No. 918]. A study of the Canellaceae has indicated that this is a natural grouping, and holds many features in common with certain families of the woody Ranales [*F.A.* 19 No. 4734]. On the basis of both morphological and wood-anatomical evidence it is recommended that New Zealand species of *Pseudopanax* and *Nothopanax* should be considered as a single genus [*F.A.* 20 No. 3659].

Cell-wall structure. Findings of studies with the electron microscope continue to pour out. Further investigations have been made into the nature of the innermost layer of the secondary cell-wall in conifers [*F.A.* 20 No. 944] and into the size, distribution and morphology of the warty excrescences found thereon [*F.A.* 19 Nos. 909, 2257, 4739]. According to some investigators, the warty structure is formed in the concluding stages of differentiation when lignification is complete or nearly so. It is quite distinct from the secondary cell-wall [*F.A.* 21 No. 2283]. Similar excrescences have been found on the tertiary wall of fibres and tracheids of hardwoods [*F.A.* 19 No. 910]. Justification for the use of the term 'tertiary wall' for this innermost layer is still being strongly debated [*F.A.* 19 Nos. 2258–9, 4739]. Work has also continued on the cell-walls in tension wood [*F.A.* 20 No. 3668]. In some hardwoods it was found that in the (gelatinous) tension-wood layer the cellulose is crystalline and lies almost axially. Cellulose interferences in the residual lignified secondary walls of normal structure in tension wood occur in the form of a 4-point diagram similar to that in normal wood, though this diagram in tension wood is partly obscured by sharp interference from the gelatinous layer. The cellulose micelles in this secondary-wall layer are arranged in a spiral at a greater angle of inclination than in the gelatinous layer [*F.A.* 20 No. 2262]. Results of further studies on pit-membrane structure have been published [*F.A.* 20 Nos. 2264–5, 3670–2; 21 No. 2284]. One investigator has reported considerable variation in the fine structure of the membrane, not only between genera but between parts of the tree, and sometimes between neighbouring tracheids [*F.A.* 20 No. 2264]. Some findings have a direct bearing on the penetration of water and preservative into the tissues [*F.A.* 20 No. 981]. At pressures of $>$ ca. 0·5 atm./m. it was found that conductivity in conifer wood drops with time, following the progressive closure of the bordered pits, until an equilibrium at 1–2% of the original value is obtained. Displacement of the torus is hastened by high pressures. These effects are more marked in early than late wood, but they are entirely lacking in hardwoods, where the bordered pits have no tori. They are reduced by treatment of the specimens with alcohol or a wetting agent. $HgCl_2$ at concentrations of 10^{-3} to 10^{-4} fixes the pit-closing membranes and prevents all blocking effects [*F.A.* 20 Nos. 978–9]. Pre-extraction with alcohol, and the consequent removal of fatty material lining the lumen of pit chambers and tracheids, aided the penetration by water of sapwood of *Pinus radiata* and *P. muricata*. The fatty material appeared to be part of a thicker membrane removable by extraction with urea and showing, under the electron microscope, a structure similar to the membrane with wart-like texture described by other workers [*F.A.* 20 No. 2263].

Fibre and tracheid length. A number of straightforward records of lengths in different woods have been published, e.g. for Poplars [*F.A.* 19 No. 4745; 21 No. 2288], Loblolly Pine [*F.A.* 20 Nos. 5096–7] and many important Chinese coniferous and broadleaved species [*F.A.* 19 No. 4746], but investigations are tending to be focused on length in relation to particular factors. Variations within the growth ring—in connexion with sampling—is one aspect investigated. In *Picea abies*, tracheid length was found to increase through the ring and then decrease towards its end [*F.A.* 20 No. 2266]. In Birch, however, the fibre length of early and late wood did not vary [*F.A.* 20 No. 3674]. Environmental [*F.A.* 20 Nos. 2268, 5098] and genetic influences have also received attention. Variations in tracheid length between different provenances of Scots Pine [*F.A.* 19 No. 4742] and the inheritance of tracheid length in Slash and Loblolly Pine [*F.A.* 20 No. 5095] have been established.

Variation in dimensions and proportions of tissues generally. Interest in such variations appears to be spreading from tracheids to other tissues and to the individual cells, e.g. *F.A.* 19 No. 4743 (important Hungarian Poplars); 20 Nos. 945 (*Picea abies*—cell dimensions), 948 (*Populus tremula*), 3673 (Indian hardwoods); 21 Nos. 922 (*Fagus moesiaca*), 2289 (*Pinus sylvestris*). From the U.S.S.R. has come a comparative study of vessel frequency and dimensions in *Fraxinus excelsior*, as between trees of seedling origin and first-generation coppice [*F.A.* 20 No. 5092].

PHYSICAL PROPERTIES OF WOOD

Use of radio-active isotopes. Radio-active isotopes are being used as a radiation source in wood research on two distinct problems: (*a*) the effects of radiation on the wood itself; and (*b*) applications in testing the properties of wood.

Work at Princes Risborough has shown that the hygroscopicity of wood is affected only by very heavy doses of radiation. With gamma rays the effect is negligible at doses below 10 million rad [*F.A.* 19 No. 2279; 20 No. 966]. American workers [*F.A.* 20 No. 5112], using doses $\leqslant 10^7$ r.e.p., induced slight changes (too small to be of practical importance) in the hygroscopicity, swelling, and decay susceptibility of Ponderosa Pine sapwood. Effects on physical and mechanical properties have been reviewed by a Russian worker [*F.A.* 20 No. 3696] whose data reveal marked decreases in some strength properties after heavy doses of radiation ($\leqslant$ 500 mega-r.e.p.). In applications to testing, it has been shown that measurements of gamma-ray absorption can be made with sufficient sensitivity to detect $\frac{1}{2}$-inch spaces in a pile of 24 boards, and this method was also successfully applied to the detection of defects in logs [*F.A.* 21 No. 944]. In Japanese work, a similar method has shown promise for revealing heart rot and its extent in standing trees: at temperatures exceeding 0° C. unsound trees were detected with 100% success [*F.A.* 19 No. 3152]. Another application, with satisfactory results, has been the determination of moisture content: in Japan the distribution of moisture in thick disks of wood was traced, and in Germany moisture changes in a young, growing tree [*F.A.* 19 No. 3407; 21 No. 2306]. Russian workers have studied the absorption of beta-rays in relation to thickness, density and moisture content of various woods; they consider beta-rays more suitable than gamma-rays for density and moisture measurements [*F.A.* 20 No. 2282]. In the United Kingdom, a semi-micro method, using beta-rays, has been devised for determining density [*F.A.* 20 No. 984]. It has been applied with success to trace density variations within individual growth rings of an increment core—a task that is both tedious and difficult by the ordinary gravimetric technique [*F.A.* 21 No. 959]. A further method evolved in the U.S.S.R. consists in saturating specimens with oil containing radioactive P^{32}, and measuring their radio-activity by Geiger counter [*F.A.* 20 No. 985].

Optical properties. Values for reflection and penetration of infra-red rays have been tabulated for a large number of Indian woods [*F.A.* 20 No. 5107]. American work [*F.A.* 19 No. 2272] has shown that penetration of ultra-violet rays into 3 softwoods was negligible; that of visible light varied largely with colour of the wood, while infra-red rays penetrated deeper and more uniformly.

Frictional properties. Stošić [*F.A.* 20 No. 5108] has determined the influence of species (Spruce and 4 hardwoods), surface smoothness, fibre direction, and pressure, on the static friction coefficient of wood against wood. Atack and Tabor [*F.A.* 21 No. 2304] have studied rolling and sliding friction between *Abies balsamea* (longitudinal surface) and surfaces of steel or polytetrafluorethylene. Rolling friction was found to be due to internal friction or hysteresis losses in the wood, and not to surface interaction, whereas sliding friction apparently depends on the m.c. of the wood and on the chemical nature of the other surface.

Thermal properties. Kanter [*F.A.* 20 No. 960] has published a nomogram for determining the coefficients of thermal conductivity and diffusivity of Birch; his results indicate that conductivity is greater (*a*) radially than tangentially, and (*b*) parallel than perpendicular to the grain. Kollmann and Malmquist [*F.A.* 20 No. 3682] have developed a theoretical formula for conductivity in relation to density and moisture content, which appears to fit experimental values quite well. Ogarkova found that the coefficient of linear thermal expansion (c.l.e.) of natural, uncompressed Birch wood depended linearly on the late-wood %; the c.l.e. of compressed wood was related to the c.l.e. of the wood before compression, and also depended linearly on the degree of compression [*F.A.* 20 No. 962]. Specific heats have been determined by Narayanamurti and Jain for 10 Indian woods [*F.A.* 19 No. 4761], and by Emčenko in Russia, using a microcalorimeter method, for Pine, Spruce and Birch wood and Birch bark [*F.A.* 20 No. 2280].

Shrinkage anisotropy. As research on the causes of this phenomenon continues, the problem becomes more complex. In investigations on a large number of Japanese woods, Nakato [*F.A.* 20 Nos. 974, 2289, 5123; 21 No. 957] found that radial shrinkage of isolated early and late wood increased linearly with increasing basic density, while the relation between tangential shrinkage and density was curvilinear. The degree of anisotropic shrinkage in transverse section (t.s.) decreased curvilinearly with increasing density. In conifers, the chief cause of anisotropic shrinkage in t.s. was traced to cell-wall structure, especially to deviations in fibril angle between the tangential and the radial wall and the distribution and spin-axis direction of active OH groups. He has also investigated the influence of fine and broad rays on shrinkage in a number of species [*F.A.* 20 Nos. 5124–5].

Detailed work by Bosshard [*F.A.* 19 No. 2284] showed that heavy woods are characterized by high absolute shrinkages and small coefficients of tangential/radial anisotropy. Bosshard considers that the effect of the microfibril direction on shrinkage is small, and that most of the shrinkage in wood is related to the thickness and degree of lignification of the middle lamella. Grzeczyński and Marciniak have shown that shrinkage of the medullary rays in Beech in connexion with tensions inherent in the living tree is the cause of the characteristic arching of growth rings inwards towards the pith [*F.A.* 20 No. 3675]. Lesser shrinkage in the radial than in the tangential direction is also attributed chiefly to the properties of the rays by Schniewind [*F.A.* 21 No. 2281]. Hanmamedov [*F.A.* 20 No. 5121], from his work on Beech, Ash and Pine, concludes that the major factors responsible for the difference in radial and tangential shrinkage are differences in intermicellar space per unit length, the strong lateral shrinkage of rays, and the greater tangential shrinkage of late wood. Wijesinghe, however, using dissected material of *Artocarpus*, *Canarium* and *Acer* [*F.A.* 20 No. 5122], found that inherent anisotropic shrinkage of the fibres must be an important factor, since the difference between radial and tangential shrinkage of the fibres—though reduced—was not removed by separation from the rays. In studies on *Casuarina inophloia* [*F.A.* 19 No. 3414] Kelsey showed that the restraint imposed by the low radial shrinkage of the large rays accounts for some of the transverse shrinkage anisotropy, but the radial intersection point of the ray material [cf. *F.A.* 19 p. 150 para 5] was not appreciably different from that for the rest of the wood. For several conifers Browne [*F.A.* 19 No. 3415] reported greater swelling in late than in early wood, the differences being greater on radial surfaces; total swelling of early plus late wood was less on radial than on tangential surfaces.

Grzecyński [*F.A.* 19 No. 3412] found that shrinkage anisotropy varied in the course of drying. In Oak and Beech (but not in Pine) the radial shrinkage, expressed in % of the maximum shrinkage observed, was initially greater than tangential shrinkage; at about 30% m.c. their positions were reversed. The two shrinkage values diverged most at about 10% m.c., and with further drying they approached equality. The relative decrease of radial shrinkage between 30 and 0% m.c. causes tensile radial stresses which increase the tangential stresses and can result in cracks.

Fundamentals of moisture relations. Though Japanese workers were unable to reach definitive conclusions as to the effect of temperature on the diffusion coefficient of *Cryptomeria japonica* wood [*F.A.* 19 No. 4771], Skaar [*F.A.* 20 No. 5127] found that for *Fagus grandifolia* wood the moisture diffusion coefficient was more sensitive to temperature in the radial than in the tangential direction, and that only radially (presumably owing to the greater importance of vapour movement in this direction) was it affected by m.c. of the wood. For bound water, Stamm showed that diffusion coefficients increased with increased temperatures in the same manner as the increase in vapour pressure of water, the logarithm of the coefficient varying as the reciprocal of the absolute temperature [*F.A.* 20 No. 5128]. This is held to support the theory that inward diffusion results from the jump of single molecules from one adsorption site to another of greater attractive force, and that water is held by H bonding. The diffusion coefficient increased exponentially with increase in the mean m.c. of the wood. In Germany, a detailed investigation has been made of the routes by which liquids (water, and molten paraffin wax) penetrate into Scots Pine wood [*F.A.* 21 No. 2316].

Much research has been done on the sorption of water vapour by wood. Kollmann [*F.A.* 20 No. 2286; 21 No. 950] has discussed the difficulties in, and apparatus for, measuring sorption, with special reference to apparatus developed at Munich. Following similar work in Germany [*F.A.* 19 No. 2281], Christensen and Kelsey, using *Eucalyptus regnans*, conclude that, during the sorption of water, lignin behaves (like cellulose and wood itself) as a swelling gel, and that sorption of water by wood may be considered approximately as the additive result of the sorption by its major chemical constituents [*F.A.* 20 No. 5114; 21 No. 953]. They also found [*F.A.* 21 No. 952] that the rate of sorption (r.s.) of water vapour in the absence of air decreased with increasing relative vapour pressure; hence diffusion of water in wood was not the factor controlling r.s. A method is proposed for ascertaining theoretically the sorption isotherm that would result from a succession of infinitely small m.c. increments, and a possible mechanism of the sorption process based on stress relaxation within the swelling gel is discussed. Stamm [*F.A.* 21 No. 954] has suggested a method of estimating the water vapour sorption corresponding to the fibre saturation point from measurements of swelling in water and the sorption/swelling ratio at different relative humidities. Noack [*F.A.* 21 No. 955] describes an apparatus for measuring sorption at elevated temperatures (> 100° C.) and water vapour pressures. Spalt, after sorption tests on White Spruce, Basswood, Redwood and *Calophyllum brasiliense* at 90° F. [*F.A.* 19 No. 2282], attributed variation between species in the extent of hysteresis to differences in reversible H-bond development between adjacent cellulose molecules, and variation between sorption isotherms to different distribution patterns of cell-wall capillaries. In further work [*F.A.* 20 No. 5113], by applying to his experimental data a theoretical equation based on the solid-solution model for polymers, he obtained descriptive results that were in basic agreement with those of previous workers. Hysteresis was less in woods rich in extractives than in those poor in them. Some hysteresis persisted in acetylated White Spruce, which was included in order to assess the effect of de-activation of surface hydroxyls.

Krpan [*F.A.* 20 No. 5119] describes methods of determining fibre saturation point from volumetric shrinkage and from crushing strength ||, with results for several Jugoslavian species. Higgins found that in some tropical hardwoods and N. American conifers, lower equilibrium moisture contents, especially at 93% r.h. (the highest r.h. tested), usually corresponded to lower fibre saturation points [*F.A.* 19 No. 2283].

Moisture and density. From work at Princes Risborough [*F.A.* 19 No. 4769; 20 No. 983] a generalized equation has been derived for determining basic density from measurements of the maximum moisture content of a wood. This method makes volume measurements unnecessary, and most of the 27 species tested required only a few days for maximum absorption.

STRENGTH PROPERTIES OF WOOD

General. Timber testing is on the increase all over the world, especially the testing of tropical hardwoods. Only a selection of the reports that deal with a comparatively large number of species can be cited here, e.g. those for India [*F.A.* 21 Nos. 2298–2300], Uganda [*F.A.* 20 No. 991], Surinam [*F.A.* 19 No. 2269; 21 No. 4881] and Uruguay [*F.A.* 20 No. 3679].

Long-term loading and creep. Two important theoretical studies on the sustained-load strength of timber have been published by Ylinen [*F.A.* 20 No. 2302; 21 No. 964]. He presents a formula relating strength under prolonged loading to values obtained by rapid bending tests, by reference to loading time, with relaxation time and the moduli of elasticity at short-time and infinite-time loads as constants. Tottenham [*F.A.* 20 No. 5133] considers Coulomb's hypothesis of a critical maximum strain to be the only one applicable to timber on the basis of present knowledge, and that the establishment of such a criterion can lead to a rapid method of determining sustained-load strength.

Japanese and American workers [*F.A.* 20 No. 5135; 21 No. 4902] have been investigating, *inter alia*, the influence of various constant temperatures and relative humidities on the time/creep relationship. In Australia [*F.A.* 21 No. 969], *Eucalyptus regnans* beams have been found to creep more at 45° than at 20° C. At the higher temperature, most of the creep took place in the first year, whereas at the lower, the creep rate was still quite appreciable after 2 years.

In work on stress in the range 50–85% of the total values, creep rate increased very little up to ca. 65%, but at 65–70% it increased rapidly with increase in stress, particularly when loading was continued for $\geqslant$ 3 hours. Recovery rate was much slower than creep rate. The relation between creep rate and applied stress below the discontinuity that occurs at ca. 67% of ultimate strength is very closely linear. The discontinuity is presumed to be an entropic phenomenon involving molecular chain strengthening in the amorphous regions at and above this stress. Moisture increase and decrease in timber under load both cause an increase in the creep rate, irrespective of whether the wood is green or dry [*F.A.* 20 No. 2303; 21 Nos. 969, 3690].

Japanese work [*F.A.* 20 No. 5134] indicates that sustained loading has no effect on the compressive strength and modulus of elasticity as tested by subsequent loading to failure. This agrees with British findings [*F.A.* 20 No. 993] with Scots Pine and Douglas Fir, which after 3 years under load showed no loss of strength, though a large increase in deflection. In tests on three species in America [*F.A.* 19 No. 2293], creep occurred at stress levels $<$ 10% of ultimate strength, a roughly linear regression being found between creep and stress up to the threshold of set, and a curvilinear one thereafter. In these tests, wood did not behave according to Hooke's law.

Strength of plywood. Continuation of the basic study mentioned in the previous leader [*F.A.* 19 p. 151] has permitted the presentation of stress values considered applicable to design calculations involving a number of wood species when used in plywood [*F.A.* 19 No. 4882] and has also demonstrated *inter alia* the manner in which the glue—and the type of glue—modify the plywood structure and hence its strength, particularly with plies $\frac{1}{20}$ in. in thickness. This same laboratory has continued its long series of reports evaluating the suitability of various timbers, especially tropical hardwoods, for use in plywood manufacture [e.g. *F.A.* 20 Nos. 2412–4]. The variations in results obtained by different standard shear-strength test methods have been studied in Germany [*F.A.* 20 No. 2420] and some difficulties pointed out [*F.A.* 21 No. 2329]. In Japan, puncture tests have been made on plywood by dropping circular weights repeatedly from the same height, or from heights varying by 5-cm. gradations [*F.A.* 20 No. 2310]; also strength tests of hard frozen plywood—at very low temperatures (− 55 to − 65° C.) the shearing, bending and nail-holding values were 10–20% higher, but impact strength was lower, than under normal condition [*F.A.* 20 No. 5132].

CHEMISTRY OF WOOD

Cell-wall constituents. Radio-active tracers are being widely used in studies of lignin and cellulose formation. In an elucidation of the pathway of conversion of glucose into phenyl-propane intermediates in lignifying tissues, they have indicated that substituted cinnamyl alcohols (coniferyl, sinapyl and *p*-coumaryl alcohols) are subjected to dehydrogenative polymerization yielding the protolignins [*F.A.* 19 No. 953]. When phenylalanine was introduced into young Spruce stems, radioactive coniferin was isolated above the point of entry after 2–3 days, indicating that coniferin is the transition stage of Spruce lignin [*F.A.* 21 No. 981]. In young Spruce, when C^{14}-labelled phenylpropane and vanillin derivatives were applied to the leaves, phenylalanine, phenylalanine plus methionine, *p*-coumaric acid, ferulic acid, *d*-coniferin and *d*-coniferin plus methionine were incorporated into the portion of the cell-wall of the secondary xylem corresponding to the lignin fraction; in *Castanea sativa*, *p*-coumaric acid, *d*-coniferin and *d*-syringin were incorporated [*F.A.* 21 No. 3698]. A thin-layer chromatography method, using silica-gel/gypsum mixtures, is especially suitable for work with radio-actively labelled compounds. By introducing coniferin into 2-year-old branches of Beech ca. 40 years old, it was found that after ethanolysis, not only vanilloylacetyl but also syringoylacetyl was radio-active. The plant was therefore able to methoxylate while retaining the ethanolysability of the lignin thus formed [*F.A.* 21 No. 4909]. Recent Russian findings suggest that, in a biological milieu, lignin probably undergoes degradation to simpler structures. These may participate in complex reactions of secondary synthesis, leading to the formation of compounds (melanoids, humic acids) characterized by complexity of the molecule and great stability [*F.A.* 19 No. 4792]. There is evidence that lignin is present mainly between the cellulose microfibrils but may penetrate within them, and that lignification begins in the middle lamella. Treatments such as partial or complete ring-barking modify the normal process of lignification. In all cases, the observed complementary distribution of peroxidase and lignin deposition supports the view that at least one peroxidase-controlled phase of lignification proceeds within the cell-wall [*F.A.* 19 No. 958]. Artificial lignification in materials that included *Pinus radiata*, *Eucalyptus regnans* and *Tilia americana* proceeded in the xylem, phloem and cambium zones and could be followed by the increasing ultra-violet absorption of these tissues. Staining reactions and the structure of the artificial lignin as observed in the electron microscope suggested that lignin was deposited between the cellulose microfibrils of the cell-wall [*F.A.* 21 No. 979]. In Latvia, analyses of lignin preparations from fast-grown *Populus trichocarpa* showed that compounds of an aromatic nature were formed in young shoots early in the growing season in considerable quantities, and that under short-day conditions a greater quantity of easily soluble lignin fractions was present [*F.A.* 21 No. 3701]. Studies on *Pinus contorta* in Bavaria, however, showed that variations in both lignin and cellulose contents were related to provenance rather than to site or climatic differences [*F.A.* 19 No. 4791], and those on Douglas Fir in the U.S.A. showed that variation in cellulose content between 8 trees was probably related to genetically controlled variability rather than to site, crown class, radial position, growth rate or % of late wood [*F.A.* 21 No. 3702]. In studies on Loblolly Pine cellulose, employing a rapid method of analysis that permitted the use of small samples, two types of cellulosic material, viz. water-resistant carbohydrate and α-cellulose, were determined, and the former proved always to be highly correlated with the latter. A high correlation also existed between the cellulose content of juvenile and mature wood [*F.A.* 20 No. 1007]. In experiments with young Pines, using C^{14}, either by injecting the trees with $Na_2C^{14}O_3$, or exposing them to a controlled atmosphere of $C^{14}O_2$, labelling during growth involved both diffusion and laydown [deposition] of radio-active material through the flow of sap; the C^{14} appeared to become an integral part of the cellulose molecular structure and of all related compounds such as glucose, mannose and xylose [*F.A.* 21 No. 2342]. Hemicellulose fractions composed of *d*-mannose and *d*-glucose residues were isolated from Sitka Spruce holocellulose and a methylated glucan and glucomannan prepared therefrom; both are linear polysaccharides composed of β-1:4-linked sugar residues [*F.A.* 19 No. 2314]. A detailed study was made of the distribution of polysaccharides in the cell-wall of Scots Pine tracheids of different ages [*F.A.* 21 Nos. 2345, 3705].

GLUES AND GLUING

Durability and general strength properties. Problems of the life-expectancy of all types of glues have continued to occupy an important place in gluing studies. Results of 11-year exposure tests at Madison, U.S.A., similar to the long-term series at Princes Risborough previously reported [*F.A.* 19 p. 152], have emphasized the superiority of phenol- and resorcinol-formaldehyde resins over urea-formaldehyde types under severe conditions [*F.A.* 19 No. 1003] while the high-temperature/moderate-humidity, 1-year accelerated tests, reported at the same time, gave satisfactory predictions of durability. This superiority of the phenolic-based types of glue finds confirmation in a recent review [*F.A.* 21 No. 1040] on the effects of insolation in the U.K., and in U.S. tests in which plywoods and laminated joints made with urea-resin glues were exposed for 3 years to 80–150° F.—a temperature range often reached for long periods in roof constructions [*F.A.* 19 No. 2362]; all 11 glues tested were weakened at 120–158°. Russian tests on the exposure resistance of joints glued by RF heating showed that low-density woods, e.g. Pine and Spruce, gave the most durable bonds [*F.A.* 21 No. 4968].

In a laboratory study of the relative decay resistance of Western Hemlock and Douglas Fir plywood [*F.A.* 21 No. 3764], it was found *inter alia* that unweathered plywood made with phenol-formaldehyde glue was much more resistant to attack by *Poria incrassata* and *Lenzites saepiaria* than solid unlaminated wood of similar size and origin, and that the decay resistance of severely weathered plywood was much lower than that of unweathered plywood, approximating to that of solid wood of the same size and species.

Studies on the effect of wood moisture content on glue-joint strength continue, with varied results [*F.A.* 19 No. 4845—PVA glues; 20 No. 1064—bone, casein and urea glues; 21 No. 2391—resorcinol and resorcinol/phenol resin glues]. The effects of sub-zero temperatures on joints and plywood glued with various urea-formaldehyde and phenol-resorcinol-formaldehyde formulations have recently been studied in Germany with Beech. No weakening was recorded after 24 hours' exposure to – 55° C. [*F.A.* 21 No. 3745]. At Princes Risborough a standard method for testing the gluing qualities of preservative-treated veneers has been developed, in which 32 glue lines are tested for bond quality as assessed by the knife test of *British Standard* No. 1455, 1956 [*F.A.* 19 Nos. 4849–50].

Factors in gluing. Of numerous researches throwing light on the various factors that make up the strenth of a wood/glue bond, only a selection can be cited. Russian work [*F.A.* 20 No. 1074] indicates that the shear strength of glued joints having the smoothest (hand-planed) surfaces is similar to that of joints with the roughest (frame-sawn) surfaces, glued joints of intermediate surface smoothness (e.g. machine-planed) proving less strong; bond strength is considered to depend primarily on the mechanical strength of the wood surface, rather than on its superficial roughness and woolliness. A U.S. study, however, on the effect of surface roughness, trueness of surface, and physical structure (density, porosity, cell-wall area), on resorcinol-glued butt or short-scarf joints of Douglas Fir [*F.A.* 20 No. 5194], found that the roughest surfaces tested gave the strongest joints in tension and impact bending, whereas no difference was found between joints in which the growth rings were aligned (early wood [e.w.] to e.w.), misaligned (e.w. to late wood), or crossed. In the U.K. [*F.A.* 20 Nos. 3764–5] other workers, studying the bonding of *Khaya ivorensis* veneers, both peeled and sawn, planed and sanded, with close-contact and gap-filling urea-formaldehyde glues, have shown that the function of pressure is not only to bring the two surfaces together, but also to promote wetting of unspread surface by transfer of glue from the spread side of the joint. Surface roughness is relatively unimportant, but the ability of glue to wet a particular surface gives better bonds with peeled veneer than with planed and sanded materials. Again, tests on Scots Pine in Germany [*F.A.* 20 No. 3763], using gluten glues, showed that, in general, the shear strength of the bond increased with roughness, wood failure developing in very rough (large-pored) specimens as the bond became stronger than the wood.

Gluing of preservative-treated timber. Much study continues to be directed to the ways in which preservatives may weaken the glue bond. The practical issues were reviewed by Northcott for the U.S.A. [*F.A.* 19 No. 3494] and more comprehensively by Bune [*F.A.* 19 No. 3493] from experience in six important countries. U.S. and Danish experiments [*F.A.* 20 Nos. 2390, 3771] indicate that creosote is liable to weaken phenol, resorcinol and phenol/resorcinol bonds with Scots Pine and Beech, but less so at higher gluing temperatures. Celcure (acid Cu chromate) does not. Other work has shown that As_2O_3 (1–5%) added to phenolic glues may not only increase shear strength but substantially decrease the setting time [*F.A.* 21 No. 3742]. The problem of pre-treating plywood against borers (*Anobium punctatum*) in New Zealand has been promisingly tackled by introducing residual contact insecticides, e.g. dieldrin, into glue-lines of casein, urea-formaldehyde and phenol-formaldehyde, 0·25% dieldrin proving, so far, effective [*F.A.* 21 No. 1044].

WOOD PRESERVATION

A great deal of research in this field is concerned with the slow, painstaking testing and improvement of existing methods and preparations, and their application to other species; progress is therefore rarely spectacular.

Improved pressure processes. In E. Germany, Pine heartwood was successfully pressure-treated with creosote after the wood, at a moisture content of 12% during treatment, had been heated to a final temperature of > 100° C. between the platens of a hot press or by high-frequency waves. Pieces with larger cross-sections tended to split if final temperatures exceeded 110°. Smaller pieces gave good results at 140°. At 160°, creosote uptake was less satisfactory. Late wood was thoroughly impregnated and early wood usually sufficiently so. Tests with *Lentinus lepideus* showed that the wood was adequately protected [*F.A.* 20 No. 2469].

Research into the penetration of preservatives into refractory wood continues. Where pressure treatment was followed by slow osmotic diffusion under controlled moisture conditions, the volume of the treated cylindrical zone increased fourfold within 11 months. Very dry specimens of Beech and Spruce heartwood could be impregnated with a vapour mixture of fungicide and water, but so far, no fungicides with a sufficiently low boiling point, high toxicity and subsequent stability have been developed to make the method commercially interesting [*F.A.* 20 No. 5244].

A method for improving penetration, developed in America, consists of injecting first an oily preservative followed by water containing a wetting agent (and, optionally, a toxic or fire-retardant chemical). The water, being immiscible with the preservative, drives it deeper into the wood. In one test with Douglas Fir poles, some heartwood penetration and up to 99% sapwood penetration (in the incised groundline zone) was obtained, against 89% sapwood and no heartwood penetration by the Lowry process [*F.A.* 20 No. 1139]. A German patent, adapting a Russian method, uses high-frequency waves for heating wood (especially heartwood) in a bath of preservative oil, thereby evaporating the moisture in the wood while creating a strong internal pressure, so that on subsequent cooling a vacuum is formed which rapidly sucks the heated oil into the wood, penetrating the heartwood. Repeated (pulsating) heating and cooling shortens the impregnation period [*F.A.* 20 No. 2471]. A first stage in the testing of Henriksson's alternating-pressure method [cf. *F.A.* 19 p. 154] in New Zealand showed good results (complete sapwood penetration) with *Pinus radiata* and Corsican Pine, whether green, part-dry, or dry, and green Douglas Fir, though not Larch at any m.c., with treating times from 14 to 22 hours [*F.A.* 21 No. 1087]. In impregnation tests in Czechoslovakia, using the Rueping process, depth of penetration of unbarked Spruce and Fir poles increased fourfold when the poles were first sprayed with water (giving a m.c. of 25–30%), which caused algae to form on the surface during a storage period. The algae did not impair quality but had a toxic effect on fungi [*F.A.* 20 No. 3837].

Novel preparations or techniques. Among new approaches, many still in the development stage, is the use of dyestuffs for wood preservation. Of a number of aniline dyes tried, using pressure treatment, only ethyl violet, belong to the triphenylmethane group, was promising. Retentions of $>$ 1·5% resulted in a weight loss of only 3% after three months' exposure to *Lenzites trabea* [*F.A.* 21 No. 2396]. Organic Sn compounds have been showing promise, being colourless, resistant to leaching and highly toxic to fungi [*F.A.* 20 No. 3832]. Coatings of polyester or polyester and fibre glass, were found to protect wood in boats from fungus atack [*F.A.* 20 No. 1165]. Non-poisonous techniques under investigation in America, aiming at improving the durability of wood through chemical modification include: (1) Cyanoethylation, a process adapted from its use with cotton. Complete resistance to *Lenzites trabea* was obtained by treating Pine sapwood to a retention of 0·95 lb./cu. ft. of acrylonitrile and 0·45 lb. of NH_3, then steaming for 2 hours at 15 lb./sq. in. (115° C.). Organic alkaline reagents plus the use of KI as a catalyst appeared promising, and may make treatment possible without high temperatures (which involve strength loss), though at higher costs. Chemical modification corresponding to ca. 1% by weight of fixed N, or ca. ¼ of the amount corresponding to a complete conversion of the cellulose to its cyanoethyl ether, was needed to prevent attack. The reaction may, however, be reversible by hydrolysis in the presence of much water. (2) The destruction of thiamine, a vitamin essential to most wood-rotting fungi, by raising the pH of the wood. An NH_3 content of 0·15 lb./cu. ft. imparted decay resistance to Pine or Gum sapwood if treatment was followed by 2 hours' steaming at 15 lb./sq. in. (3) The inactivation of trace elements essential to the fungi, for instance by chelating agents [*F.A.* 21 No. 1086].

In soil-block culture tests, small specimens of Sitka Spruce treated by (*a*) impregnation with a phenolic resin, (*b*) acetylation, (*c*) heat stabilization, (*d*) cross-linking with formaldehyde, (*e*) bulking with polyethylene glycol, showed good resistance against *L. trabea.* Decay inhibition was obtained with swelling reductions of ca. 70% in (*a*) and (*b*), 40 in (*c*) and 50 in (*d*) and an 18% retention in (*e*). Leaching with NaOH to remove formaldehyde with (*d*), and agar tests with (*e*), indicated that no toxic effect was involved. Inhibition is explained by the prevention of sufficient water uptake to support decay, and by the removal, in (*b*) and (*c*), or blocking, in (*a*) and (*d*), of susceptible OH groups, preventing decay enzymes from dissolving wood components [*F.A.* 21 Nos. 2457, 3784]. Similar results with phenol-formaldehyde resins that were further polymerized after impregnation, and with cyanoethylation, are also reported for *Pinus ponderosa* [*F.A.* 21 No. 5044]. Modification of the properties of wood by means of ionizing radiation, by impregnating the wood with a monomer (e.g. styrene) and then exposing to gamma rays from a Co^{60} source for polymerization, constitutes a similar approach to improve decay resistance [*F.A.* 21 No. 5040]. Other new methods studied in Russia include the preparatory treatment with CH_3COOH and H_2SO_4 solution of woods difficult to impregnate; ultrasonic treatment of wood during impregnation at 20–400 kilocycles/sec. for 30 and 60 min. in aqueous and oily preservatives; sterilization by gases, e.g. chloropicrin; and treatments to make wood 'hydrophobic' (water-resistant) by methyltrichloro-silane solutions [*F.A.* 21 No. 2447] or the use of chlorinated (coniferous) resins which gave good fungus control in field experiments, lasting 2–4 years, with Pine [*F.A.* 21 No. 5030].

In the field of non-toxic methods of controlling insects, German research aiming at destroying micro-organisms essential to them has achieved some success with *Anobium punctatum*; medium-sized larvae fed on impregnated Alder and Pine wood with 2·6 kg./cu.m. of 4-aminobenzole sulphamide, had the yeast cells that are essential symbionts eliminated from their intestines in ca.6 months, resulting in their death soon afterwards [*F.A.* 21 No. 1127]. Of greater practical interest is an essentially non-toxic method for the control of drywood termites, consisting in the use of inert sorptive dusts that adsorb or disrupt the lipoid protective layer (wax) covering the termite epicuticle, leading to death by desiccation. Silica gels, aero gels or precipitates, montmorillonite clays, attapulgite clays and diatomites proved the most effective of a great many substances tested, all giving 100% kill in $\leqslant$ 5 hours. Incorporation of water-soluble fluorides as monomolecular layers increased the effect, particularly at higher humidities [*F.A.* 20 Nos. 5285–6].

Location of preservatives within the wood. An investigation of Douglas Fir blocks treated with mineral salts, chiefly Tanalith C, using optical (including polarizing) microscopy in conjunction with a stain (dithio-oxamide), and electron microscopy, electron- and X-ray diffraction techniques, showed that the cell-wall, particularly the middle lamella, was stained deeply, though patchily [*F.A.* 19 No. 4907]. From the orientation of the stain in relation to the microfibrils, and from the pattern under the electron microscope and of electron-diffraction diagrams, it was concluded that some at least of the Cu within the cell-walls occurs in the form of a Cu/cellulose complex [cf. *F.A.* 19 pp. 153–4] though other interpretations have been offered [*F.A.* 21 No. 3703]. Similar results were obtained with $CuSO_4$ and other metallic salts and in later work which showed preservative deposits both in the lumina and the cell-walls [*F.A.* 21 No. 2441; 22 No. 1082]. Another electro-microscope study, of wood impregnated with fluoride and $HgCl_2$ solutions, showed that the particles crystallizing in wood from the impregnating solutions can be viewed and measured; and that, *inter alia*, their density of distribution decreased from the surface toward the centre of the impregnated zone and the depth of penetration was greater in moist and late wood than in dry and early wood [*F.A.* 19 No. 2409]. In an investigation of Pine wood impregnated with PCP, the preservative content of late wood was ca. twice that of early wood. The difference here is thought to be explained by the difference in the number of open pits (ca. 70% in late and only 50% in early wood) and of resin ducts (mainly in the late wood). The crystals were localized more in the pits and less in the rays (mainly of early wood) and on the tertiary wall [*F.A.* 19 No. 4906].

The relationship between marine borers and marine fungi. This relationship has been the subject of interesting though not yet conclusive research. Laboratory investigations in Germany suggested that *Limnoria* are unable to digest native, long-chain cellulose, and depend for their food on the co-operation of Ascomycetes and *Fungi imperfecti* which break down the cellulose [*F.A.* 19 No. 2402]. Though in a later series of tests under slightly different conditions *Limnoria* lived longer in sterile Pine or Beech than did unfed controls—suggesting that they obtained some nourishment—their life span, at any rate in Pine, was markedly longer in the presence of marine fungi (alive or dead) or *Pleurotus ostreatus* [*F.A.* 21 No. 5060]. American research, however, has not confirmed such a symbiotic relationship [*F.A.* 20 No. 5270]. It has also been suggested that the capacity of teredinid larvae to attach themselves, as also the development of the young adults, depends largely on marine fungi and other microorganisms [*F.A.* 19 No. 2402]. From German aquarium experiments with various substances, including extracts from Pine wood and from marine fungi, it was concluded that the swimming larvae were not attracted chemotactically from a distance, but only accidentally landed on surfaces which they then examined for suitability. Permanent settlement took place only on wood with some fungal growth (marine species of Ascomycetes, *Fungi imperfecti* or Basidiomycetes), and not on sterile wood, wood the surface of which had been softened chemically, or wood coated with algae [*F.A.* 21 No. 5059].

DIMENSIONAL STABILIZATION

Risi and Arseneau have carried out a series of experiments in Canada on the stabilization of wood by acetylation, crotonylation and crotylation, butylation, allylation and phthaloylation [*F.A.* 19 Nos. 1077–8, 2431–2; 20 No. 2480]. With the first, acetyl content and anti-shrink efficiency increased, and hygroscopicity decreased, with increase of treating time. The stabilization effect appeared to depend both on bulking and on reduction of hygroscopicity. Crotonylation gave anti-shrink efficiencies of 49–73%; corresponding values for crotylation were $\leqslant$ 80%, but this treatment severely degraded the wood. Neither *n*- nor *t*-butylation is considered to be of any practical value, but allylation may have commercial possibilities. Phthaloylation provided the greatest degree of stabilization but was somewhat affected by leaching.

Various patented stabilizers developed for paper have proved useful for wood [*F.A.* 20 No. 1150]. Stamm [*F.A.* 20 No. 3841] found that the use of cross-linking reactions for dimensional stabilization is sound and economical when the molecular weight of the cross-linking agent is low. Cross-linking with formaldehyde reduced toughness and abrasive resistance of the wood, but other agents of low molecular weight may affect wood properties less. Stamm has also described brushing and soaking tests with polyethylene glycol [*F.A.* 21 No. 2457], which appeared to reduce checking without affecting toughness. Static bending strength and abrasion resistance were somewhat reduced, but no more than would be expected from the bulking of the fibres. Retentions of 17·6% prevented decay by *Lenzites trabea* [see also *Novel preparations or techniques*, under *Wood preservation* (preceding section)].

A series of experiments has also been made in Japan [*F.A.* 20 Nos. 2481, 5255–6; 21 Nos. 1100–1] on stabilization by β-naphthylamine, cyanoethylation, and treatments with phenolic resin or formaldehyde plus various catalysts.

SEASONING OF WOOD

Fundamental. The bench-scale experimental kiln noticed in *F.A.* 17 No. 3409, giving control of temperature, air speed, and air moisture, and allowing of continuous observation of these factors and of the weight of a suspended specimen, has been used in further Japanese studies of characteristic drying curves [*F.A.* 19 No. 114] and of simple estimations of drying time from any given moisture content [*F.A.* 19 No. 1115]—the latter study covering 18 Japanese coniferous and 22 broadleaved species.

A new German laboratory kiln includes infra-red heating equipment in addition to self-recording weighing devices etc. [*F.A.* 20 No. 3874]; another, for high-temperature research, is reported from British Columbia [*F.A.* 19 No. 2469].

Effects of air speed and flow direction. These have been intensively studied at Princes Risborough [*F.A.* 19 Nos. 1116–7, 2468, 3580; 20 No. 1182]. Values for the heat transfer coefficient, h in B.Th.U./sq. ft./hour/° F. from air at 60° C. to water at 50° for mean air speeds (V) of 1·5–9 ft./sec., were estimated from the water loss in wet Corsican Pine during the initial constant drying rate. It was found that $h = 1{\cdot}9 + 0{\cdot}48\ V$. Using these values, the effect of V on the temperature drop across a pile of wet timber was examined theoretically and the advantage demonstrated of high V and, more particularly, frequent reversals of air flow. Air volume was also important. The optimum speed for Beech and Scots Pine respectively was 4 and 5 ft./sec., with reversals every 15 min. and some necessary modification of relative humidity. One-way flow and less frequent reversals proved less satisfactory. Preliminary tests in the German kiln mentioned above, with Beech and Pine, at 65° C., 70% r.h. and V ranging from 1 to 13·5 m./sec., indicated great power saving in the early drying period with $V = 12$ m./sec. [*F.A.* 21 No. 5085].

Drying schedules. Information for individual species or genera are reported at *F.A.* 19 Nos. 1109 (Douglas Fir), 1112 (Hornbeam), 2467 (Oaks), 2470 (Redwood), 2473 (Beech); 20 Nos. 2527 (Hornbeam), 3877 (4 Californian hardwoods), 5296 (> 300 spp.); 21 Nos. 1143 (Radiata Pine), 1144 (Obeche), 3809 (*Pycnanthus angolensis*), 3814 (*Arbutus menziesii*), 3815 (3 *Entandrophragma* spp.), 3817 (Black Oak).

Comprehensive studies of Japanese [*F.A.* 19 No. 1114–5] and Tanganyika [*F.A.* 21 No. 5082] timbers have also appeared.

Drying dimension stock. Numerous studies are evidence of increasing interest in this procedure, for which substantial advantages are claimed over drying the material from which the stock is cut, e.g. furniture parts [*F.A.* 19 No. 1111; 21 No. 2493], shoe lasts [*F.A.* 20 No. 1185; 21 No. 2498], box shooks [*F.A.* 20 No. 1184], Oak staves [*F.A.* 19 No. 1113], rattan canes [*F.A.* 20 No. 2525], shuttles and spools [*F.A.* 20 No. 2527].

High-temperature seasoning continues to attract much research. The temperatures concerned here are mainly of the order 105–140° C., though an automatic box-shook drier in the U.S.S.R. uses combustion gases at 250–300° C. [*F.A.* 20 No. 1184]. Pine and Beech feature in most European studies, while in the U.S.A. Douglas Fir and Western Hemlock have been favourably reported on [*F.A.* 19 No. 2469] and also many southern hardwoods [*F.A.* 20 No. 2528] except Red and White Oak and Red Gum (heartwood of *Liquidambar styraciflua*), which show severe internal checking. W. German work includes a comparative study of some physical and mechanical properties of Pine and Beech boards, air-dried, and also kiln-dried at conventional and high temperatures [*F.A.* 20 No. 3880]—little difference being found between the three drying methods, and of high-temperature drying of Pine boards with special reference to methods of stacking [*F.A.* 20 No. 3876]; the former study is paralleled by one on Pine boards in the U.S.S.R. [*F.A.* 19 No. 3584] using superheated steam as an additional method. Other studies with superheated steam are noticed at *F.A.* 19 No. 4957; 20 No. 1188; 21 Nos. 1143, 2496. Research on boiling in petrolatum, which continues—with some promise—in the U.S.S.R. (using native species), is noticed at *F.A.* 19 Nos. 2475, 3585; 21 Nos. 2499–2500.

Whatever the medium used, success in high-temperature drying appears to depend largely on finding the right schedule, though some species have so far proved refractory. An increasing number of comparative studies show little or no loss in physical and mechanical properties of timber from the use of high temperature [*F.A.* 20 No. 1186, 3880; 21 No. 2500]. The whole subject has been comprehensively reviewed in the U.S.A. [*F.A.* 19 No. 3583].

High-frequency drying. Reports of work in this field continue to be few. In a French investigation small blocks of Beech, Hornbeam and Pine were successfully dried from > 20% m.c. to 8–10%, though Pine showed stresses; Oak at once developed cracks and a *Lagerstroemia* species exuded resin [*F.A.* 19 No. 1122]. In W. Germany a worker using specially devised apparatus and cubes of Beech, Oak, Maple and Silver Fir has made an intensive study of the many factors involved in this type of drying [*F.A.* 19 No. 2474; 20 Nos. 2530–1]. A commercial installation is also described in the last quoted abstract, in which wood is conveyed along a tunnel between an earthed electrode and several high-potential electrodes set at various distances from the wood. Fans remove the moisture released. The drying takes 2–4 hours irrespective of initial m.c. Costs are calculable from the general estimate of 1·1 KWH needed to evaporate one litre of water. Advantages claimed are: no equipment corrosion; thick material dried without degrade or internal stresses; uniform m.c.; speedy drying; automatic and continuous operation; no skilled labour requirement.

PULP AND PAPER

Suggestions have been made [*F.A.* 20 No. 5320] that some if not all of the desiderata for pulpwood (above-average fibre length, a high proportion of thin-walled cells, late wood varying from 15 to 50%, and low extractive and high cellulose content) may be genetically controlled and that selective breeding might therefore be used to develop trees with the features required. Wood density and compressive strength have been recommended as an index of paper quality, and breaking length in kraft paper from Scots Pine was found to increase with decreasing bending strength [*F.A.* 19 No. 4975]. Tracheids of the early wood will give compact papers with good tensile and bursting strength but lower tearing strength, and those of the late wood high tearing strength but less good tensile strength [*F.A.* 19 No. 2495]. In Douglas Fir and Slash Pine, ring width had little effect on pulp yields [*F.A.* 20 No. 3896]. Compression wood of *Pinus radiata* could be pulped by the sulphate—but not the sulphite—process as applied to normal wood, without seriously affecting pulp strength in 50/50 blends of such pulp with commercial pulp of the same species; the sulphite process was unsuitable because 'acid-susceptible' wood containing numerous minute compression failures, associated with the compression wood, gave rise to 'broken fibres' [*F.A.* 20 No. 2566]. Sulphate pulping tests of *Pinus serotina*, sound or suffering from various stages of *Fomes pini* decay, showed that yield, tearing strength and lignin content of the pulp decreased, and breaking length and bursting strength increased, with increasing decay. The α-cellulose content of the pulp was highest with the most decayed wood, but its degree of polymerization fell considerably at advanced stages of decay, while folding endurance, apparent density and brightness were not affected [*F.A.* 21 No. 5114]. In Czechoslovakia, branchwood of Spruce, Pine and Hornbeam, but not Beech, which should only be used as an admixture, gave sulphate pulps with strength properties almost equal to those for normal pulpwood; but costs were high—50 to 100% above normal per unit of volume [*F.A.* 21 No. 3838].

Studies on the effect of storage of the wood on pulp properties have been made in Australia [*F.A.* 21 Nos. 1166–7]. Sulphate-pulping and papermaking properties of *Pinus radiata* and *Eucalyptus regnans* were not affected by storage of dry chips for several months before pulping but storage of *P. radiata* under [fresh] water at room temperature appeared to be deleterious. In another study, however, when *P. radiata* pulpwood billets were stacked with good air circulation, pulp strength decreased by 35% in 12–15 months, whereas close stacking or underwater storage retarded loss of strength. Salt-water storage of logs [*F.A.* 20 No. 5329; 21 No. 5115] has been found to cause a concentration in them of certain S compounds formed by bacterial reduction of inorganic sulphates absorbed from the water, and these compounds have been found to inactivate the organo-mercurial fungicides used for the preservation of moist groundwood.

PARTICLE-BOARD MANUFACTURE

The phenomenal post-war expansion of this industry is reflected in the great amount of research being devoted to the details of the manufacturing process and their effect on board properties. In a discussion of various problems of adhesion and chip properties in board production, Marian [*F.A.* 20 No. 1221] has drawn attention to the present trend towards using chips with undamaged cellular surface structure, i.e. from slicing rather than crushing chippers, and the distribution of the adhesive as a film rather than as droplets. As regards the factors contributing to satisfactory binding strength (b.s.), U.S. investigations on flake board [*F.A.* 21 No. 3845] indicate that the relative compression area of a flake mat—a function of particle geometry and compression ratio—is the significant factor determining the b.s. of the whole board. Under long-term load [*F.A.* 21 No. 5121] an exponential relationship in the 65–80% range exists between the stress ratio and time to failure; neither binder (urea or phenolic) nor sp. gr. appears to be significant, and deflection patterns resemble those found in wood. Another U.S. study on the effect of flake dimensions, using Douglas Fir [*F.A.* 21 No. 5122], showed that for the three degrees of board sp. gr. (0·65 to 0·85) and two glue contents (3 and 5%) examined, b.s. increases with increasing flake length (flake thickness having no influence), dimensional stability increases with increasing flake length and decreasing thickness, and for optimum properties in general, the length/thickness ratio should be 200. Similar studies with *Quercus coccinea* flakes [*F.A.* 20 No. 3922] and in Japan with flakes of *Fraxinus commemoralis* [*F.A.* 19 No. 4990] and other species [*F.A.* 20 No. 2578] underline the importance of particle dimensions, particularly length and length/thickness ratio, rather than the type or concentration of the binder.

The working properties of particle board as a substitute for wood in a variety of applications are also being actively investigated, e.g. as the basic material for constructing furniture [*F.A.* 19 No. 1160—W. Germany] and as the groundwork for veneer [*F.A.* 20 No. 3924—U.S.S.R., effects of surface roughness]. An interesting development is reported from W. Germany [*F.A.* 20 No. 5342], viz. experimental production of chipboard from unbarked wood. Bending strength, swelling and water absorption were higher, but tensile strength and screw-holding power lower, than for chipboard made from the barked material.

Effects of drying and various pressing treatments etc. Much detailed research is also in progress into the effects on important board properties of moisture differences in the wood particle layers [*F.A.* 19 No. 1156—W. Germany], of pressing temperatures [*F.A.* 19 No. 1157—Japan; 20 No. 2581—U.S.S.R.] and of adding moisture repellents such as paraffin wax or resins [*F.A.* 19 No. 1157, 3622—Japan; 21 No. 2541—U.S.S.R.]

ABSTRACT SECTION

☞ New readers are reminded of the *Guide to the use of Forestry Abstracts* which will enable them to get the maximum value from the *Abstracts*—see inside back cover. Brief extracts from this publication are reproduced on the *Readers Guide Sheet*, issued with No. 1 of each volume of *Forestry Abstracts*.

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See also Nos. 1311, 1500, 1540–1, 1625, 1656, 1726, 1735, 1744–5, 1783, 1918, 1922, 1974, 2008, 2015, 2329–30, 2352, 2403, 2414, 2438, 2494, 2504, 2512, 2550.

1305. **Foreign language translations of forest products research results.** U.S. Forest Products Laboratory, Madison. 1960. pp. 29.

Includes translations made since the 1959 list was published [see *F.A.* 21 No. 1307].

0 (023). Elementary Works. Popular Manuals

1306. Wolff, L. **Science and the forester.** G. Bell & Sons, London. 1960. pp. 159 + 16 photos. Price 15*s*. I.F.B.

A book on forestry and forest science, especially for the young, presenting many facts of tree physiology, ecology, protection, utilization etc. grouped round a simple story.

0 (048.1). Bibliographical Lists

See also Nos. 1326, 1397, 1408, 1474, 1552, 1946, 1999, 2329.

1307. Bauer, F. [Editor]. Fortschritte in der Forstwirtschaft. [**Progress in forestry**.] BLV Verlagsgesellschaft, Munich, Bonn, Vienna. 1960. pp. xvi + 305. Many refs. [G.g.] Price £2. 5*s*.

Reviews the development of forest science during the last 15 years, largely on the basis of literature in German, with 16 sections, as follows: Forest botany (*B. Huber*) [includes vegetation studies, forest history, wood anatomy, and physiology]; Forest seed, genetics and breeding (*E. Rohmeder*); Forest soil science (*W. Wittich*); Regeneration (*A. Bonnemann*); Forest tending (*J. N. Köstler*); Forest protection (*G. Wellenstein*); Forests and game (*F. Nüsslein*); Yield studies (*R. Schober*); Forest management (*M. Prodan*); Extraction planning and road construction (*F. Backmund*); Logging and transport (*H. Steinlin*); Utilization and marketing (*H. Mayer-Wegelin*); Forest administration (*K. Hasel*); Business economics of forestry (*G. Speidel*); Forest policy (*J. Speer*); Forestry research (*G. Mitscherlich*) [organization of research in E. and W. Germany]; and International co-operation in forest science (*J. Weck*).

1308. Benda, P. Československá lesnická bibliografie 1957–1958. [**Czechoslovakian forestry bibliography 1957–1958.**] Výskumný Ústav Lesního Hospodářství a Myslivosti, Zbraslav-Strnady. 1960. pp. 75. 2291 refs. [Cz.] [Cf. *F.A.* 21 No. 2618.]

1309. Brašiškis, S., Ivaškevičius, A., and Galvydis, J. [Editors]. Lietuvos TSR mokslų akademijos darbuotojų straipsnių bibliografija 1945–1954. [**Bibliography of articles by the members of the Lithuanian Academy of Sciences, 1945–54.**] Lietuvos TSR Mokslų Akademija, Vilnius. 1960. pp. 407. 2712 refs. [Lith.Russ.]

The references are arranged alphabetically by authors, under the various disciplines. The section on forestry, orchards and nature conservation contains 57 references. There is an author index.

1310. Kapelner, H. **References on forestry and forest products in Israel—1959.** *Leafl. For. Res. Inst., Ilanoth* No. 10, 1960. pp. 4. 50 refs. [E.] [Cf. *F.A.* 20 No. 4035.]

0 (084.3/4). Maps. Atlases

See Nos. 1319, 2625.

0 - - 010. Research Technique

1311. Weidmann, A., and Thommen, F. **The use of punched-card machine systems as a means of rationalization in forestry.** *Transl. N.Z. For. Serv.* 1960. pp. 29. Transl. from *Mitt. Schweiz. Anst. Forstl. Versuchsw.* 35 (4), 1959 (317–68). Limited distribution.

[See *F.A.* 21 No. 5.] A translation from the German, with the original booklet attached.

0 - - 014. Classification

1312. Das Oxford-System der Dezimal-Klassifikation für Forstwesen. [**The Oxford system of decimal classification for forestry**.] Deutsche Zentralstelle für Forstliche Bibliographie, Freiburg im Breisgau. 1957. pp. 110. [G.] Price *DM*. 10. I.F.B.

The authorized German version, with German subject index.

1313. Sistema Oxford de clasificación decimal para bibliografía forestal. [**The Oxford system of decimal classification for forestry**.] Comisión Española de Bibliografía y Terminología, Madrid. 1959. pp. 133. [Span.] Price *Pesetas* 150. I.F.B.

The authorized Spanish version, with Spanish subject index.

1314. Système de la classification décimale d'Oxford pour les sciences forestières. [**The Oxford system of decimal classification for forestry**.] École Nationale des Eaux et Forêts, Nancy. 1960. pp. 234. [F.] I.F.B.

The authorized French version, with French subject index.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

1315. KOPP, D., and HURTTIG, H. Zur Weiterentwicklung der Standortsgliederung im Nordostdeutschen Tiefland. [**The further development of site classification in the N.E. German lowlands.**] *Arch. Forstw.* 9 (5), 1960 (387–486). [G.]

Describes the existing classification framework in which the many site types (mapping units) distinguished are grouped first by water regime and next largely by soil texture. As the series so formed often contain sites of great diversity silviculturally, a new classification into groups similar in growth potential and silvicultural requirements is proposed, taking account of water regime, nutrient status, and local climate, largely on the basis of the vegetation. A table of the proposed groups, their vegetation, humus, soil, etc., as well as the species and treatments (including amelioration) proposed on each, is presented and discussed.

1316. HILLS, G. A., and PIERPOINT, G. **Forest site evaluation in Ontario.** *Res. Rep. Ont. Dep. Lds. For.* No. 42, 1960. pp. 64. 7 pp. of refs.

The Research Branch, Ontario Department of Lands and Forests, has developed a classification of forest areas for two main purposes: (1) the evaluation of the potential productivity of sites for a variety of forest crops, and (2) the evaluation of the factors of each area (such as forest succession) which affect the choice and success of cultural treatments. Part 1 of the report outlines the classification of sites into types and the subsequent evaluation of these types from the viewpoints mentioned above; both physiographic and biotic features are considered, the final site type being a combination of these. The evaluation provides for the rating of forest production achieved under various degrees of management effort. Part 2 demonstrates how the classification and evaluation may be applied, using the production of *Pinus strobus* on a reference area as an example. An economic analysis provides for the comparison of the cost of producing Pine on each unit with various degrees of effort. *From authors' summary.*

111. The Atmosphere. Meteorology. Climate and Microclimate

111.0. Practical Meteorology. (Methods, Data, Forecasts etc.)

See No. 1891.

111.2. Radiation and Temperature

1317. BAUMGARTNER, A. Gelände und Sonnenstrahlung als Standortfaktor am Gr. Falkenstein (Bayerischer Wald). [**Topography and solar radiation as a site factor on the Grosser Falkenstein (Bavarian Forest).**] *Forstwiss. Cbl.* 79 (9/10), 1960 (286–97). 11 refs. [G.g.e.]

[Cf. *F.A.* 21 No. 1313.] The distribution of solar radiation on the mountain was determined for an area of 30 sq. km. Maps are presented delineating aspect and degree of steepness and the total amounts of solar radiation received during the growing season and for the whole year.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

1318. KIDD, W. J., JR. **The advantages of using ethylene glycol in seasonal storage precipitation gages and a method for computing the initial charge.** *J. For.* 58 (11), 1960 (882–4). 3 refs.

Ethylene glycol, despite a relatively high initial cost, is shown to have many advantages over $CaCl_2$ solution as an antifreeze. Computation of the quantity required for the initial charge is described.

111.8. Climatology. Climate and Microclimate

See also Nos. 1343, 1612.

1319. WALTER, H., and LIETH, H. Klimadiagramm-Weltatlas. [**World atlas of climate diagrams.**] VEB Gustav Fischer Verlag, Jena. 1960. pp. [86 loose-leaf]. Many refs. [G.e.f.russ.span.] Price [£9. 16*s*.]

The atlas is in loose-leaf form and the sheets so far issued cover: Spain and Portugal; Western Europe—1 [excluding the British Isles and Scandinavia]; the Near East; the sub-continent of India; Africa (S. Africa, Africa S. of the Sahara, Madagascar, Africa N. of the Sahara, and the Atlas region); America; and Australia. Other parts of the world will be included in further issues of the loose-leaf sheets. There is a map for each continent or group of countries, showing the boundaries between the main climatic types (10 in all) and their subdivisions. Separate diagrams are given for the individual meteorological stations in the region, showing altitudes, maximum and minimum temperatures, and curves with ordinates showing monthly means of precipitation and temperature and the abscissa the months of the year, the area between the curves indicating dry or wet seasons [cf. *F.A.* 20 No. 1352]. Frost data are also given where applicable.

1320. KREČMER, V. Mikroklimatický a vodní režim borových kotlíků. [**Microclimate and moisture regime of group fellings in Pine.**] *Práce Výzkum. Úst. Lesn. ČSR* No. 19, 1960 (5–208). 180 refs. [Cz.russ.g.]

Presents a very detailed report of microclimatic and moisture conditions in (*a*) circular clear-fellings of 11 and 12 m. diam., and (*b*) an elliptical felling (30 × 18 m., long axis oriented W.S.W.–E.N.E.), in the same Pine stands as were the subject of an earlier work [see *F.A.* 22 No. 1368]. In general, (*b*) gives a much bigger area with favourable ecological conditions for regeneration than does (*a*). In (*b*) the poorer conditions at the W. to N.E. margin can be overcome by quick artificial regeneration with a suitable species. It is concluded that (*b*) is a suitable method of converting pure Pine stands on dry sandy soils into mixtures.

1321. Chroust, L. Změna prostředí borové tyčoviny pod vlivem výchovných zásahů. **[Environmental changes in a pole stand of Scots Pine as a result of tending operations.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (6), 1960 (435–54). 26 refs. [Cz.cz.russ.e.]

[Cf. *F.A.* 21 No. 1635.] Thinning was done in 1957 on plots in a stand 30–33 years old, removing 8, 17, 23 and 27% of b.a. Data are presented for 1958 on changes in the light regime, air and soil temperatures, and the water regime. Only the light regime, depth of frozen soil, interception of precipitation by the canopy, and evaporation at the soil surface were changed by >10% from the values obtained in an unthinned control plot. Air temperature at the soil surface, soil temperature, and soil m.c. changed only slightly (difference from the control ca. 3%). The degree of change depended on method and intensity of thinning; the most important factor affecting stand environment was the degree of canopy closure.

1322. Protopopov, V. V. Osobennosti temperaturnogo režima vozduha na koncentrirovannyh lesosekah v el′nikah. **[Features of the air-temperature regime on concentrated clear fellings in Spruce forests.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (37–43). 5 refs. [Russ.]

[Cf. *F.A.* 21 No. 1322; 22 No. 859.] Presents data collected in the Vologda region on clear fellings measuring 230 × 1000 m. and 4 years old, in the *Piceetum herboso-hylocomiosum*. Air temperatures were measured at 5 cm. from the ground during Aug. 1954 on areas covered with various herbaceous and tree species at various distances from the E. and W. walls of the forest. It was concluded that, on areas carrying young broadleaved species, with *Epilobium angustifolium* and *Spiraea* sp. covering 90–100% of the ground, the air temperature at 5 cm. approximates to that of a forest environment. Similar conditions also prevailed in bare 1 × 1 m. patches in the midst of dense *E. angustifolium*.

1323. Goryšina, T. K., and Nešataev, Ju. N. K izučeniju mikroklimata dubovogo lesa. **[The microclimate of Oak forest.]** *Dokl. Akad. Nauk SSSR* 133 (5), 1960 (1239–42). 6 refs. [Russ.] A.P.B.

Graphs and discusses diurnal fluctuations in air and soil temperature, and r.h. at various seasons and in various kinds of weather, in old Oak high forest at Borisovka, Belgorod region.

1324. Ross, P. **Microclimatic variations in a deciduous forest, Lower New York State.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (333–4). O.B.D.

Microclimate was studied over a period of 2 years at 10 stations in the Harvard Black Rock Forest. Comparisons were made with data from an airfield 8 miles north of the forest. Vegetation and the elevation of the forest are the major factors contributing to the lower weekly min. temperatures in the forest, the higher relative humidities, higher weekly humidities, higher weekly max. temperatures from the beginning of December to the end of April, and lower weekly max. temperatures from the beginning of April to the end of November. Vegetation and slope aspect contribute to the differences of temperature and relative humidity among the 10 sites.

1325. Rice, E. L. **The microclimate of a relict stand of Sugar Maple in Devils Canyon in Canadian County, Oklahoma.** *Ecology* 41 (3), 1960 (445–53). 24 refs.

Air and soil temperature, evaporation, insolation and air movement were higher, and soil moisture was depleted faster, on the slopes outside the canyon, but relative humidity was generally higher inside. The amelioration of environmental stresses in periods of extreme conditions is probably important in the survival of Sugar Maple (with other eastern plants) some 185 miles west of its typical range in eastern Oklahoma.

114. Soil. Soil Science

1326. **Bibliography of soil science, fertilizers and general agronomy, 1956–1959.** Commonwealth Bureau of Soils, Harpenden. 1960. pp. xxv + 762. Price £3. 10*s*.

114.1. Soil Physics

See also Nos. 1320–1, 1323–5, 1330, 1336, 1342–3, 1349–50, 1355, 1361, 1368–70, 1377, 1697, 1757.

1327. Chudecki, Z. Wstępna charakterystyka oddziaływania erozji wodnej na fizyko-chemiczne właściwości gleb w strefie moreny czołowej na pojezierzu pomorskim. **[Characteristics of the effect of water erosion on the physical and chemical properties of the soils in the region of the frontal moraine of the Pomeranian Lake District.]** *Zesz. nauk., Wyższa Szkoła Roln., Szczecin* No. 3, 1960 (97–133). 25 refs. [Pol.russ.e.]

One of the six selected slopes carried a Beech stand 50 years old; the soil here had better physical properties than that under permanent pasture or arable land. Extensive tabulated data are presented.

1328. Stoeckeler, J. H., and Curtis, W. R. **Soil moisture regime in southwestern Wisconsin as affected by aspect and forest type.** *J. For.* 58 (11), 1960 (892–6). 7 refs.

Soil moisture in the top 2 ft. of soil was significantly higher in a N.-facing than in a S.-facing slope on 5 different sampling dates along a transect in native timber across an E.-W. valley near La Crosse, Wis., in 1957. It was about twice as high on the N. as on the S. slope. On the N. slope there was a regular increase in soil moisture from top to bottom of the slope. On the S. slope this trend also appeared, but less consistently, because of pressure of shallow ledge rock on the upper ⅓ of the slope and the recharge effect of the run-off from that zone on the middle ⅓ of the slope. On N. slopes, m.c. under northern hardwoods was almost double that under a White Pine plantation. On S. slopes, m.c. in a Scots Pine plantation was similar to that in native Oak woods. Since the volume growth in

Scots Pine was 3·5 times as high as in Oak, conversion to the former on the drier slopes by reforestation is suggested as a means of greatly increasing timber production in farm woods in the area. *From authors' summary.*

1329. Travleev, A. P. O termoizoljacionnoj roli lesnoj podstilki. **[The role of forest litter and humus horizons in thermal insulation.]** *Počvoved.* 1960 (10), (92–5). 6 refs. [Russ.russ.e.] A.P.B.

Investigations were made in the Dnepropetrovsk region in pure stands of Oak, Robinia, and Ash. Thermal insulation by the litter-and-humus layer depends not so much on its thickness or total weight as on its physical properties; the insulating effect is greatest in Oak stands, less in Robinia and least in Ash. The thermal insulation capacity of the litter and humus of all three species decreases in passing from dry to fresh sites. Stands of pure Oak, with their slowly decomposing litter, are to be preferred in these steppe conditions, protecting the soil against overheating in summer and freezing in winter, and reducing surface run-off to a minimum.

114.2. Soil Chemistry

See also Nos. 1327, 1339–40, 1342, 1349–50, 1355–61, 1364, 1527, 1530, 1532, 1696, 1801, 1820, 1962–4.

1330. Firsova, V. P. **Influence of forest fires on the soil.** *Trudy Instituta Biologii, Akademija Nauk SSSR, Ural'skij Filial* No. 16, 1960 (41–52). Many refs. [Russ.] From *abstr.* in *Chem. Abstr.* 54 (20), 1960 (21571). P.R.

A review, including data on chemical changes, with numerous references.

1331. Beaton, J. D., Peterson, H. B., and Bauer, N. **Some aspects of phosphate adsorption by charcoal.** *Proc. Soil Sci. Soc. Amer.* 24 (5), 1960 (340–6). 32 refs.

Investigates the thermodynamics of aqueous phosphate adsorption on six typical synthetic and natural charcoal materials, as a basis for evaluating the effect of charcoal, formed during forest fires, on the availability of phosphate ions in the soil.

1332. Gorham, E. **The pH of fresh soils and soil solutions.** *Ecology* 41 (3), 1960 (563). 4 refs.

Reports and discusses the range of values obtained by 3 methods using glass electrodes for the following soils from the English Lake District: (*a*) highly organic mor-humus layers in Oak woods; (*b*) much less organic mull-humus layers in mixed hardwoods; (*c*) a 4-m. mud core from the deepest part of a fertile lake, Esthwaite Water. The lowest pH values were obtained by direct insertion of the electrodes into fresh soils, being 0–1·3 pH units below those of fresh soil solutions immediately after expression by hydraulic press. These in turn gave readings of 0–1·8 units below those obtained after aeration; the mean difference was negligible for (*a*), 0·7 for (*b*) and 1·3 for (*c*). The maximum difference between pH by direct electrode insertion and by measurement on expressed or aerated soil solutions was 1·5 pH units in (*a*), 1·9 in (*b*) and 2·1 in (*c*), and the means were 0·9, 1·6 and 1·8 respectively.

1333. Zöttl, H. Die Mineralstickstoffanlieferung in Fichten- und Kiefernbeständen Bayerns. **[The supply of mineral nitrogen in Bavarian Spruce and Pine stands.]** *Forstwiss. Cbl.* 79 (7/8), 1960 (221–36). 76 refs. [G.g.e.]

The accumulation of mineral N as determined by the incubation method [see *F.A.* 21 No. 3947] was used as a measure of N supply in 47 different Scots Pine and Norway Spruce stands. Calculations showed a mean annual supply of $\nless$ 31 kg. mineral N/ha. A close correlation exists between these mineral-N values and the N content of the needles, and between needle N and tree growth. On the basis of equal wood production, Pine and Spruce make similar demands on mineral N.

1334. Evdokimova, T. [I.]. **The biological circulation of elements under coniferous-mossy forest.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (107). O.B.D.

[Cf. *F.A.* 20 Nos. 4065–6.] The investigations were carried out in Karelia, in the sub-zone of the middle taiga. A wide occurrence of highly productive Pine forest with luxuriantly developed moss/lichen cover is typical for the region studied. The primitive humus soils are formed under moss/lichen cover on rocky mountains and mountain ridges, composed of dense crystalline schists. The development of the podzolization begins where the coniferous species are settled upon these soils. The gross analysis of mountain rocks, soil, and vegetation showed that within the limits of one biocoenosis, N, S, K, P, Ca, and (specifically for Karelia) Mn and Ti, are involved most intensively in the biological cycle. An intensive accumulation of the micro-elements Sr, Zn, Pb, and others, is going on simultaneously. Very favourable forest-growth conditions are created, owing to an intensive biological accumulation of nutrient elements in the undeveloped primitive soils, which possess a high reserve of N. A very important rôle in the N balance of these soils is played by lichens, which are carriers of a specific group of oligonitrophile micro-organisms.

1335. Gradusov, B. P. K himiko-mineralogičeskoj harakteristike počv srednej časti Karel'skogo perešejka. **[The chemical and mineral characteristics of the soils of the central part of the Karelian isthmus.]** *Počvoved.* 1960 (7), (53–62). 10 refs. [Russ.russ.e.] A.P.B.

The soils studied included one under the *Piceetum hylocomiosum*, in a stand 100–120 years old, site class II. Data on the chemical composition of the needles, litter and soil horizons are tabulated. There was a considerable accumulation of K, P, Ca, and Mg in the needles; breakdown of litter led to intensive leaching of these elements and to an increase in the content of SiO_2 and sesquioxides. Under these conditions, illuvial-humus-iron podzolic soils are formed; their clay fraction contains minerals of the kaolinite and montmorillonite groups, the content of the latter group increasing in the lower horizons.

1336. Bacsó, A., and Leszták. **Effects of certain forests on the properties of black (chernozem)**

soils. *Agrokémia és Talajtan, Budapest* 9, 1960 (67–76). [Hu.?] From *abstr.* in *Chem. Abstr.* 54 (16), 1960 (16715). P.R.

Under *Picea abies* forests the pH of the soil, and its hydrolytic acidity and degree of unsaturation, all decreased, while there was no significant change in the relative concentrations of exchangeable cations. The $CaCO_3$-containing layer began 100–150 mm. deeper under Pine than under the other forests studied. The humus content of the soil below Pine and *Quercus robur* slightly exceeded that of comparable non-forest soil; there were no differences in N content. In spring, summer and autumn, the depth of rain penetration was greater under *Q. robur* and *Robinia pseudoacacia* than under Pine, where soil m.c. in summer was the same as that of non-forest soil.

1337. Remesov [Remezov], N. **Influence of the Oak forest on the chemical properties of the soil.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (322–3). O.B.D.

Investigations were made over a 10-year period in the Oak forests of the Voronezh State Forest Reserve, which are situated on quartz sand underlaid by loam. Variations were found in amounts of nutrients supplied to the soil surface by leaf shedding, these depending on the age of the forest and the weather. The role played in the nutrient cycle by root excretion products and dying parts of the roots was also studied. The whole nutrient cycle operates in such a way, in these particular conditions, as to lead to an increase, not only of humus and N, but also of the gross content of Al, Fe, Ca, Mg, P, Cu, V, Mn, Ba and Sr in the upper part of the soil profile. It was established (1) that the upper part of the profile was enriched with loamy particles, and (2) that there was a considerable increase in the cation absorption capacity, a high degree of base saturation, and a slightly acid reaction.

1338. Sidorkov, G. A. **Influence of Beech plantations on the chemical composition of gray forest soils [in the Ukraine].** *Sbornik Stud. Naučno-Issledovatel'skih Rabot Ukrainskoj Sel'skohozjajstvennoj Akademii* No. 3, 1958 (157–9). [Russ.?] From *abstr.* in *Chem. Abstr.* 54 (19), 1960 (20040). P.R.

A study of pure and mixed 18- and 22-year Beech stands on grey forest soils in the Kiev region. No significant changes occurred in the morphological properties of these soils. They showed higher acidity and also some changes in humus content and cation exchange capacity.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 1329, 1334–7, 1346, 1354–5, 1360–2, 1521, 1530, 1820, 1953.

1339. Parfenova, E. I., and Jarilova, E. A. K voprosu o lessivaže i opodzolivanii. **['Lessivage' and podzolization.]** *Počvoved.* 1960 (9), (1–15 + 4 plates). 50 refs. [Russ.russ.e.] A.P.B.

Surveys the literature and some experimental data, concluding that Duchaufour's distinction between '*lessivage*' and podzolization [cf. *F.A.* 18 No. 1226] is invalid as a basis for soil classification.

1340. Lossaint, P. Étude experimentale de la mobilisation du fer des sols sous l'influence des litières forestières. I. II. **[Study on Fe mobilization in soils under the influence of forest litter. I. II.]** *Annales agronomiques, Paris* 10 (4; 5), 1959 (369–414; 493–542). Many refs. [F.f.e.g.russ.] O.R.E.

[Cf. *F.A.* 19 No. 2643.] Fresh litters and their extracts are capable of dissolving varying amounts of Fe, both in a loam and in a ferruginous sand. Activity in mobilizing Fe varies with the kind of litter—Alder, Hornbeam and Oaks possess a high solubilizing power, while Beech, Spruce, Pine and Fir do not. During decomposition, litter of the first group rapidly loses activity, which decreases to that of the conifers after 5 months' decomposition *in vitro*. Reasons for the difference between the two groups of species are discussed, and the hypothesis that Fe migrates in a colloidal-complex form was confirmed. The higher the Ca content, the more organic material is needed to keep the Fe in solution. Polyphenols played an important role as dissolving, reducing and complexing agents in the mechanism of dissolution and transport of Fe. While anaerobic decomposition promotes the dissolution and displacement of Fe, it is not an essential condition for Fe mobilization. All the extracts investigated, both from fresh and decomposed litter, were capable of reducing and complexing Fe at pH values occurring in the soil.

1341. Sief, L. Aspetti pedologico-forestali della Valle Fiorentina (Cadore). **[Forest/soil relations in the Valle Fiorentina (Cadore).]** *Ital. for. mont.* 15 (4), 1960 (146–56). 14 refs. [It.it.f.]

After some data on the climatic and geological environment, describes an interesting example of soil development in pure Spruce stands. In even-aged stands, originating in clear felling, the development of a mor humus leads to podzolization. In uneven-aged stands treated as selection forest, on the other hand, the soil remains permanently at the brown-earth stage. It is concluded that clear felling of Spruce in this region should be avoided for silvicultural reasons (no natural regeneration occurs on the mor) as well as on hydrological grounds.

1342. McComb, A. L., and Riecken, F. F. **Effect of vegetation on zonal soils of certain biosequences in the forest-prairie region.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (240). [E.] O.B.D.

Comparisons within the prairie, prairie-forest (prairie recently occupied by forest), and forest biosequence reveal that soils developed under forest vegetation have least clay in the A horizons, most clay in the B horizons, highest acidity in all horizons, lowest organic matter in A_2 and B horizons, and have less permeable, more poorly aerated B horizons. The prairie-forest transition soils are intermediate. Native trees on prairie-forest soils are 5–15 ft. taller and produce 25–60% more wood per unit area than those on forest soils. In central Iowa, prairie-forest transition soils on nearly level, glacial till support *Tilia* spp., *Fraxinus* spp., *Ulmus* spp. and some *Quercus* spp.; forest soils support *Q. alba*, *Carya ovata* and *Q. velutina*. In south-eastern Iowa, level, loess-derived, transition soils support *Q. alba*, *C. ovata*, *Q. velutina* and *Q. borealis* with *Fraxinus* spp. and *Ulmus* spp.; forest soils support *Q. bicolor*, *Q. stellata*, *Q. marilandica*, *Q. imbricaria* and *C. ovata*. Forest occupancy of former prairie soils has resulted in soil deterioration, and the ecological succession under a humid-subhumid continental climate has been prairie→mesic forest→xeric forest, as soil changed under the influence of forest vegetation.

1343. Cooper, A. W. **An example of the role of microclimate in soil genesis.** *Soil Sci.* 90 (2), 1960 (109–20). 17 refs. O.R.E.

A study on N. and S. slopes in S.E. Michigan, mainly under Oaks. It is concluded that the higher soil temperatures and more rapid cycles of freezing and thawing and of wetting and drying on S. slopes promote greater chemical and biotic weathering, and are thus major factors accounting for the greater clay content of the B horizons of these soils.

1344. Love, C. W., and Brown, B. R. **Substances in leaves affecting the decomposition of litter.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (104–9).

Studies are in progress in an attempt to determine the nature of the substances in leaves that seem to hinder the decomposition of forest litter. Working with an aqueous extract of *Calluna vulgaris* leaves, a number of substances have been identified which may be derived from tannins that could render leaf proteins insoluble and give rise to raw humus.

1345. Kendrick, W. B. **The time factor in the decomposition of coniferous leaf litter.** *Canad. J. Bot.* 37 (5), 1960 (907–12). 9 refs. O.R.S.

Describes and discusses the implications of a method for determining the duration of various stages of the decomposition of such litter on mor sites. The % loss in dry weight of needles in the L, F_1 and F_2 layers compared with fresh litter was calculated by weighing equal numbers of needles from each. From this, by use of conversion factors, the equivalent weight in fresh litter was found. Comparison of the equivalent weight of litter in each layer with the measured annual fresh litter production gave the approximate mean time spent by a needle in each layer.

114.4. Soil Classification. Soil Types

See also Nos. 1339–43, 1612, 1628, 1678.

1346. Rubcov, D. M. Podzolisto-bolotnye počvy. **[Podzolic boggy soils.]** *Počvoved.* 1960 (7), (20–31). 10 refs. [Russ.russ.e.] A.P.B.

Studies were made in the taiga zone of the Komi ASSR on (1) peaty, podzolic, gley-type soils under Spruce and Birch/Spruce forests of the *hylocomioso-polytrichosum* group, and (2) peaty, podzolic, gley soils under Spruce and Spruce/Pine forests with *Polytrichum* and *Sphagnum* mosses. Soils (1) represent the first stage in bog formation on gley-podzolic soils of the northern taiga; soils (2) represent a further stage. The formation of these soils is attributed to accumulation of water from precipitation, without groundwater being involved. In the transition from (1) to (2), there is an increase in the depth of the peat layer and the rate and depth of gleying, the humus content of the mineral horizon decreases and its mobility increases, mobile Fe accumulates and the exchange and hydrolytic acidity increase in the peat layer, and the podzolization process becomes less pronounced. In these soils podzolization tends to decrease in intensity from S. to N.

1347. Šály, R. Príspevok k poznaniu našich podzolových lesných pôd. **[Studies on podzolic forest soils of Slovakia.]** *Lesn. Čas.* 6 (4), 1960 (249–74). 61 refs. [Slovak.russ.g.]

Presents findings from a detailed analysis of 6 typical soil profiles, and concludes that soils hitherto all classed as podzols differ genetically and should be divided into 5 groups: 'illimerized' soils [cf. *F.A.* 21 No. 2649] (the commonest group), iron podzols, humus podzols, podzolized brown forest soils, and pseudogleys.

1348. Ćirić, M. O nekim nalazištima podzola u centralnoj Bosni. **[Some sites of podzols in central Bosnia.]** *Nar. Šumar, Sarajevo* 13 (11/12), 1959 (665–8). 4 refs. [Croat.g.]

In this region podzols are confined to sites of >900 m. alt. on quartz-rich parent rock in boreal *Picea abies* forest. The morphological and chemical properties (tabulated) of samples from two areas show them to belong to the sub-type iron-humus podzol.

1349. Ignatov, I. Obrazuvane i svojstva na opodzolenite kaneleni gorski počvi i Sofijsko. **[Formation and properties of the podzolized cinnamon forest soils in the S.E. part of the plain of Sofia.]** *Naučni Trudove, Agronomičeski Fakultet, Visš Sel'skostopanski Institut "Georgi Dimitrov", Sofija* No. 8, 1960 (49–61). 18 refs. [Bulg.russ.e.] A.P.B.

The vegetation is mainly *Quercus* spp. with a few Pines. Data are presented on the morphology, and physical, chemical and biological properties of the soils.

1350. Tsener [Cener], G. G. **Some particularities of light-gray podzol forest soils of northwest Altai.** *Izvestija Akademii Nauk Kazahskoj SSR* (*Serija Botan. i Počvoved.*) No. 3, 1960 (32–43). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (20), 1960 (21576). P.R.

Discusses the results of studies made of forest soils under Fir (*Abies* sp.), Aspen and Birch in the N.-W. Altai region. A number of diagrams showing chemical and mechanical composition are given. The data obtained are intended for use in future reforestation plans.

1351. Sys, C. La carte des sols du Congo belge et du Ruanda-Urundi. **[The map of the soils of the Belgian Congo and Ruanda-Urundi.]** *Pédologie, Bulletin de la Société Belge de Pédologie, Gand* 10, 1960 (48–116). 22 refs. [F.du.e.] O.R.E.

Presents a morphogenetic soil classification, with data for 24 soil profiles.

1352. Leamy, M. L., and Blakemore, L. C. **The peat soils of the Auckland Islands.** *N.Z. J. agric. Res.* 3 (3), 1960 (526–46). 11 refs. O.R.E.

Describes the peat soils on part of the islands (ca. 200 miles S. of New Zealand). The three plant associations found on them, viz. (1) Southern Rata (*Metrosideros umbellata*) forest, (2) Rata and scrub with *Suttonia divaricata* dominant, (3) tussock grasslands, are briefly described.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 1333–4, 1364, 1526, 1530, 1611, 1669, 1678, 1801, 1816, 1844, 1962–4, 2233–4, 2236–7.

1353. Collis-George, N., and Davey, B. G. **The doubtful utility of present-day field experimentation and other determinations involving soil-plant interactions.** *Soils & Fertil.* 23 (5), 1960 (307–10).

It is suggested that, since the influence of soil physical and micro-meteorological factors is known to be of great significance in determining the biological response of plants, the time is now appropriate to restrict the number of conventional field experiments and replace some of them with completely instrumented experiments. Until complete descriptions of experiments are available, the quantitative importance of environment and its interactions with fertilizer and cultivation practices cannot be determined. With such information, a limited number of field trials would yield more applicable information than the large number of uninstrumented trials now in existence. The argument is extended to (1) the limited applicability of pot and glasshouse trials; (2) the variation between replicates in field trials as an aid to soil science; (3) the limited utility of soil surveys; (4) the poor correlation between arbitrary soil extracts and field responses; (5) the misuse of a common test species for assessing comparative soil fertility in several regions; (6) the poor correlation between plant analyses and soil deficiencies. *Authors' summary.*

1354. Wilde, S. A. **Ameliorating effect of Jack Pine (*Pinus banksiana*) and Red Pine (*P. resinosa*) plantations established on depleted sandy soils of Wisconsin.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (431). O.B.D.

A study on sandy soils of glacial outwash, depleted by agricultural use and long left fallow. The soils were afforested with 2-year-old Pine 29 years before the study. Analyses revealed appreciably higher fertility in the soil supporting *P. resinosa* than in that under *P. banksiana*, especially in felled areas. This is attributed to the inherently high photosynthetic capacity of *P. resinosa*, its well developed and deeply penetrating root system, and the efficiency of chelating compounds from root sloughings, facilitating the release of available nutrients from micas, feldspars, and Fe-Mg minerals.

1355. Rennie, P. J. **Some long-term effects of tree growth on soil productivity.** *Repr.* of *abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (323–4).

On a typical, nutrient-deficient moor podzol in Britain, various afforested sites supporting stagnating trees were compared with adjacent unplanted moor. Some 70 years' growth of both hardwoods and conifers suppressed the natural moor vegetation (predominantly *Calluna*) and brought about important structural changes within the upper, particularly the raw-humus, horizons. The % of free-draining pores was greatly increased and conditions of poor aeration were no longer present. The characteristically thin, hard ironpan had softened, and there were substantial increases in the amounts of total and exchangeable Ca in the top foot of the profile. Offsetting these improvements, there was a marked increase in the thickness of raw humus (especially under conifers) and an increase in the already intense acidity of the mineral horizons. In addition, there were decreases in the already very small, exchangeable-base and reserve-Ca contents of the deeper horizons, apparently brought about by the relatively high nutrient uptake of the tree crop. Continued satisfactory tree growth on soils of this poverty calls for preserving the improved structural condition in the upper horizons and preventing the decline in Ca status of the lower horizons.

1356. Lingappa, B. T., and Lockwood, J. L. **Fungistatic effects of lignin, lignin monomers, and model substances.** *Phytopathology* 50 (9), 1960 (644).

In an investigation of the fungistatic action of soils, lack of nutrients did not appear to be its cause. Various soil extracts did not inhibit, and some stimulated, the germination of conidia of test fungi. Humus and humic acids were non-toxic. However, lignin-like substances contained in ethanol or dioxane extracts of washed, defatted soil, and native Spruce lignin, lignin monomers and model substances inhibited or prevented germination at 60–150 mg./ml.

114.6. Soil Biology

See also Nos. 1334, 1356, 1532 *et seq.*, 1556, 1611, 1743.

1357. Runov, E. V., and Terehov, O. S. K voprosu ob aktivnosti katalazy v nekotoryh lesnyh počvah. **[Catalase activity in some forest soils.]** *Počvoved.* 1960 (9), (75–80). 20 refs. [Russ.russ.] A.P.B.

Presents data on catalase activity (c.a.) in: peaty-humus gleyed podzolic soils under Birch and Spruce, and peaty bog or fen soils in the central taiga zone; leached chernozems under pure stands of several species in the forest-steppe zone; and carbonate chernozems poor in humus, under plantations and ravine forests (several species and mixtures) in the dry steppe zone. C.a. was related to species and soil type; it was lower under Spruce or Pine than under hardwoods or Larch. C.a. was greater in the litter and humus than in the mineral soil horizons, decreasing with increasing depth. C.a. increased during the growing season in both the litter and humus horizon and the mineral soil, and some relationship was observed between the degree of c.a. and the number of micro-organisms present.

1358. Šumakov, V. S. Biohimičeskaja aktivnostt emno-seroj lesostepnoj počvy pod pologom raznyh, nasaždenij. **[Biochemical activity of dark-grey forest-steppe soil under different plantations.]** *Počvoved.* 1960 (10), (47–54). 27 refs. [Russ.russ.e.] A.P.B.

Enzyme (catalase and invertase) activity, nitrification capacity, and general biological activity ('respiration') were studied in soil under pure *Quercus robur* var. *tardiflora*, *Acer platanoides*, *Fraxinus excelsior*, *Tilia cordata*, Elms, a mixture of these species, Spruce/Elm, Oak/Elm, and Oak/Maple in the Ukraine. Biochemical activity was related to the cover species; it was found to show seasonal changes, which were more clearly marked under species having a well developed fibrous root system (Maple, Ash, Lime). Biochemical activity decreased with depth, being highest in the litter-and-humus layer.

1359. Orfanitskij, Ju. A., Fedčenko, M. A., and Ardašev, M. Ja. Ob ammonifikacii i nitrifikacii v počvah nekotoryh tipov vyrubok Arhangel'skoj oblasti. **[Ammonification and nitrification in soils in certain types of felled areas in the Archangel region.]** *Počvoved.* 1960 (10), (79–85). 13 refs. [Russ.russ.e.] A.P.B.

[Cf. *F.A.* 21 No. 3948.] The studies were made on the A_0 horizon of thin, light sandy-loam podzols in clear-felled areas in Spruce forests. Various times had elapsed since felling and the sites had been colonized by (*a*) *Deschampsia flexuosa*, or, after burning, by (*b*) *Epilobium angustifolium*. The greatest ammonification capacity (a.c.) was found in soil on a site felled one year previously, potentially of type (*a*). The a.c. of the A_0 horizon on (*a*) sites decreased with increasing time since felling. On (*b*) sites, a.c. of the A_0 horizon increased with time since felling, and the nitrification capacity of (*b*) sites 1–5 years old was 5–10 times that of (*a*) sites. As far as N nutrition is concerned, the best chances for forest regeneration are on fresh (*a*) sites, and (*b*) sites 1–5 years old.

1360. Golley, F. B. **An index to the rate of cellulose decomposition in the soil.** *Ecology* 41 (3), 1960 (551–2). 2 refs.

Describes a technique whereby a 5 × 5-cm. square of pure α-cellulose is placed between a folded rectangle of aluminium screen and inserted vertically in the soil, the upper edge flush with the soil surface. The strip is removed after a certain time and the rate of cellulose breakdown estimated by computing its remaining area. In South Carolina, strips were placed in sites with (*a*) light, (*b*) medium and (*c*) heavy broomsedge (*Andropogon* spp.) cover, and under (*d*) *Pinus taeda* and (*e*) *Quercus laevis* litter. On all sites, the % of each strip rotted per month increased during the spring, and, after a halt between June 12 and July 7, increased again. Cellulose placed in the ground in July and examined in September showed 24% decay for (*a*), 46 for (*b*), 91 for (*c*), 65 for (*d*) and 91 for (*e*). In (*a*)–(*c*) complete decomposition occurred in 6 months. The unexplained failure of tests in mountain rain forest in Puerto Rico (where strips showed <1% decay), and in Spruce/Fir forest and alpine tundra in Wyoming (no decay) indicates that the method, though a valuable index where definite results are obtained, is not effective under all conditions.

1361. Omzetting van organisch materiaal in de grond. **[Decomposition of organic material in [forest] soil.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 48, 1960 (13–6, 32). [Du.e.]

[Cf. *F.A.* 21 No. 1337.] The dry summer of 1959 reduced the density of soil fungi and bacteria and consequently the decomposition of organic material. At Hackfort, cellophane sheet decomposed more slowly under the litter of a calcareous mull than under that of a mor, which remained moist longer. Fungal colonization of freshly fallen leaves was, for each tree species, restricted to a specific, limited combination of fungus species. Tabulated results show the density of mites and Collembola in the different soil types at Hackfort. Oribatid mites were more common in mor than in calcareous mull. Studies in a Scots Pine plantation at Oostereng, cultivated and fertilized 6 years earlier, have shown greater biological activity in untouched soils and those cultivated and marled than in those only cultivated or cultivated and limed.

1362. Meyer, F. H. Vergleich des mikrobiellen Abbaus von Fichten- und Buchenstreu auf verschiedenen Bodentypen. **[A comparison of microbial decomposition of Spruce and Beech litter on different soil types.]** *Repr.* from *Archiv für Mikrobiologie, Berlin* 35, 1960 (340–60). 27 refs. [G.g.]

Compares the vegetation and the physical, chemical, and microbiological characteristics of the A horizon under Spruce (*S*) on (1) a eutrophic brown forest soil, (2) a podzolic brown forest soil, (3) a pseudo-gley podzol and (4) a moderately developed iron podzol, with conditions on similar sites under Beech (*B*) [cf. *F.A.* 21 No. 31]. The pH of the humus under (*S*) was everywhere lower than under (*B*), differences being particularly marked in (3) and (4). Whereas under (*B*) the N content of the L layer was greater in (1) and (2) than in (3) and (4), the position was reversed under (*S*); absolute values of N were higher under (*S*) than under (*B*). Under both species, N content was often higher in the F_1 than in the L or F_2 layers. In general, the C/N ratio decreased for both species from the L to the H layers, values under (*S*) being greater in (1) and (2), but smaller in (3) and (4). Micro-organisms under (*S*) were again most abundant in the F_1 layer; apart from the L layer, which had more fungi per gram of organic matter, micro-organisms were much fewer than under (*B*) in (1)–(2); in (4) bacteria and fungi were more abundant than under (*B*) in the L and F_1 layers. Except for (4), the ratio of mould fungi to bacteria was considerably higher under (*S*) than under (*B*). Whereas under (*B*) micro-biological activity was greatest in the F_1 layer, it decreased under (*S*) from the L to the H_2 layer. It was in all layers much less than under (*B*) and there was a much more rapid decline from (1) to (4), production of oxygen in the F_1 layer of (4) under (*B*) being greater than in (1) under (*S*). In the H layers, difference of site exceeded in importance that of species. The author calculates that mineralization of the H_1 layer of (1) would take 9·4 years under (*B*) and 17 under (*S*), the corresponding values for (2) being 10·3 and 40, for (3) 20 and 121, and (4) 40 and 121.

1363. JENSEN, V. ***Arthrobacter ramosus*** **spec. nov., a new *Arthrobacter* species isolated from forest soils.** *Årsskr. Vet.-Landbohøjsk.* 1960 (123–32). 12 refs. [E.e.]

The bacterial flora of mineral soil samples from three Beech stands proved to be dominated by a single species of *Arthrobacter*, for which the name *A. ramosus* is proposed.

1364. DOBBS, C. G., BYWATER, J., and GRIFFITHS, D. A. **Studies in soil mycology.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59,* 1960 (94–100). 3 refs.

[Cf. *F.A.* 20 No. 4089.] The monthly germination assay of 12 forest soils has continued to show a seasonal variation in mycostasis, which is at a maximum in the summer and a minimum in winter. A comparison with local weather records has shown some correspondence between the monthly ground-frost records and stimulated germination and growth of fungi on some of the soils. Sugar estimations of soil samples kept at a range of temperatures have shown that both freezing and high temperatures release reducing sugars in the soil, as well as removing any inhibitory effect. The restoration of mycostasis in chrome-washed sterile sand was found to follow infection by bacteria; and of these bacteria, 3 isolates that inhibited germination of test spores all proved to be gram-negative rods.

1365. GIFFORD, D. R. **Soil fauna research.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59,* 1960 (100–2).

A study of the aggregations of oribatid mites was begun by investigating the effect of fungal mycelium in litter upon their distribution. A technique for the sterilization of cores of litter by γ-rays, their inoculation with specific mycelia, and their return to the forest for a re-colonization study, was evolved.

1366. RABELER, W. Die Artenbestände der Regenwürmer in Laubwald-Biozönosen (*Querco-Fagetea*) des oberen und mittleren Wesergebietes. **[The species of earthworms found in hardwood forests of the upper and middle Weser region.]** *Mitt. Florist.-Soziol. Arbeitsgemeinsch.* (*n.s.*) No. 8, 1960 (333–7 + 2 tbls.). 18 refs. [G.g.]

An investigation of the species composition and relative abundance of the earthworm fauna in the litter and top 20 cm. of soil of (chiefly) Beech forest on limestone (*Melico-Fageta, Carici-Fageta*) and sandstone (*Luzulo-Fagetum*) and Oak/Hornbeam forests (*Querco-Carpineta*). Earthworms were most abundant in the last named.

114.7. Soil Surveys and Surveying

See No. 2268.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 1321, 1327–9, 1336, 1798–1804, 1852–4.

1367. KIHLBERG, S. Himmelsberget: en undersökning av skogsbeståndets inverkan på vattenhushållningen. **[Himmelsberget: a study of the influence of the forest stand on water economy.]** *Grundförbättring, Uppsala* 11 (2; 3), 1958 (119–40; 175–200). 23 refs. [Sw.sw.e.*e.*] H.S.B.

Precipitation and run-off were recorded over the years 1925–37 on two neighbouring catchments. In 1925 both were covered with nearly mature forest (mean ages 100–115 years), mainly Spruce, some Pine and a little Birch and other hardwoods. One catchment was clear-felled in 1931, the other remained untouched throughout. Results of measurements for the whole period are tabulated. After felling, run-off increased by 11·9 ± 2·9% of the precipitation, but the difference decreased in successive years, with the growth of regeneration, at a rate that would restore the hydrological *status quo* in 21–22 years. The increase in the coefficient of run-off appeared to be of roughly the same magnitude throughout the year. Storage (calculated as the difference between precipitation and run-off plus evaporation) of water in bogs, as soil moisture, and as ground-water, and of snow, in the period Aug.–March, amounted to ca. 140 mm. on the catchments before felling and was reduced by ca. 25 mm. (ca. 15%) as a result of clear felling. Both the annual maximum and the annual minimum run-off figures were increased by the felling.

1368. KREČMER, V., and FOJT, V. Příspěvek k poznání některých složek vodního režimu borového porostu. **[On the components of the moisture regime of Scots Pine stands.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (5–55). 48 refs. [Cz.russ.g.]

Studies were made in 1954–58 in a stand of age class IV, density 0·8, on sandy soil on a dry site, 260 m. alt., mean annual precipitation ca. 640 mm., groundwater not accessible. Interception, soil m.c., the snow cover, and dew formation were investigated. Results showed that ca. 72% of all precipitation penetrated the crowns, rain penetrating more readily than snow. Fluctuations in interception were very great, and were all affected by the intensity and frequency of the precipitation in individual months and years. Only after 0·3 mm. of rain (in a day) does water begin to penetrate the crown. In the stand, days with dew were only 12% of those outside the stand. Dew occurred mainly during cloudy, overcast weather, and only in spring and autumn. Dew formation within the stand was both ecologically and hydrologically negligible—3% of the amount in the open. Using the results of earlier German work [see *F.A.* 13 No. 36] it was calculated that the moss and lichen cover could hold on average 4·1 mm. of precipitation; in the growing season the moss and lichen cover intercepted on average ca. 30%, and in dry periods up to 100%, of the precipitation within the stand.

1369. YLI-VAKKURI, P. Metsiköiden routa- ja lumisuhteista. **[Snow and frozen soil conditions in**

the forest.] *Acta for. fenn.* 71 (5), 1960. pp. 48. 78 refs. [Fi.e.]

A full version, with detailed research data, of a study already noticed [see *F.A.* 22 No. 58].

1370. DORTIGNAC, E. J., and LOVE, L. D. **Relation of plant cover to infiltration and erosion in Ponderosa Pine forests of Colorado.** *Repr.* from *Transactions of the American Society of Agricultural Engineers, St. Joseph, Mich.* 3 (1), 1960 (58–61). 7 refs.

The purpose of this paper is: (1) to make available some findings obtained with the Rocky Mountain infiltrometer with reference to plant cover and erosion indices; (2) to compare infiltrometer results with plot data on run-off; (3) to propose criteria for determining satisfactory infiltration rates and acceptable quantities of erosion in these forests.

1371. MOLOTKOV, P. I., and POLJAKOV, A. F. Metody izučenija povreždenij počvy pri splošnyh rubkah i posledujuščej ėrozii v gornyh lesah. [**Methods of studying damage to soil by clear felling and subsequent erosion in mountain forests.**] *Počvoved.* 1960 (8), (87–91). 17 refs. [Russ.russ.e.] A.P.B.

Proposes a classification of damage to the soil resulting from logging operations: 0—no damage; I—A_0 horizon disturbed; II—A_0 horizon carried away and the top soil horizon disturbed; III—linear damage (trails); IV—linear and over-all damage; V—covered by detritus. Categories III and IV are each subdivided by the depth to which the damage extends. This classification, combined with measurements on small plots (1 × 2 m.) with a special measuring rule (illustrated and described), has given very good results in erosion studies covering several years.

1372. CURTIS, W. R. **An automatic trigger device for use on FW—1 water level recorders.** *J. For.* 58 (10), 1960 (819–21).

Describes, with specifications, the construction and operation of a device that can be attached to water-level recorders so that they begin to operate only when water flows past the measuring station. Clocks need to be rewound and charts changed only after periods of flow, thus eliminating routine visits to stations where no flow has occurred.

1373. GAVRILOVIĆ, S. Nova otkrića u oblasti borbe sa erozijom. [**New discoveries in the field of erosion control.**] *Šumarstvo* 13 (3/4), 1959 (149–60). 16 refs. [Serb.f.]

Discusses FAO and foreign work on erosion, and illustrates Jugoslavian stream-gauging and flow-control apparatus at the experimental station of the 'J. Černi' Hydrological Institute, where erosion and flow in a small catchment area (1600 sq. m.) under *Robinia pseudoacacia* are being studied.

1374. STALLINGS, J. H. **Soil conservation.** Prentice-Hall, Inc., Englewood Cliffs, N.J. 1957. pp. x + 575. Many refs. Price 81*s*.

A work based on 20 years' experience in the U.S. Soil Conservation Service, covering historical and geographical aspects, fundamental problems, conservation practices, and farm and watershed planning. The need for an approach combining a variety of measures is stressed. Chapters on wild life, shelterbelts, woodland farming, sand-dune stabilization, catchment management and land-use planning are included.

1375. JAMES, J. W. **Erosion survey of the Paroo—Upper Darling region. Part IV. Erosion.** *J. Soil Conserv. Serv. N.S.W.* 16 (4), 1960 (253–76). 14 refs.

Types of erosion in the area are classified and related to vegetation alliances. Causes of erosion include overstocking with sheep, fire, vermin, and depletion of natural timber stands, particularly of valuable drought fodder trees, of which Mulga (*Acacia aneura*) is the most important. [Cf. *F.A.* 22 No. 72.]

1376. ZAHAROV, P. S. Rasprostranenie pyl′nyh bur′ na Severnom Kavkaze i opyt bor′by s nimi pri pomošči lesnyh polos. [**The distribution of dust storms in the N. Caucasus, and attempts to control them with the aid of shelterbelts.**] *Počvoved.* 1960 (9), (56–61). 13 refs. [Russ.e.] A.P.B.

Determines the regions worst affected, the most dangerous seasons (March/April and July/Aug.), and the frequency and severity of the storms, and points out the importance of shelterbelts in reducing damage to agricultural crops.

1377. BULULUKOV, JU. G., and VASIL′EVA, E. I. Osobennosti uvlažnenija i sostojanija lesnyh kul′tur na stupenčatyh terrasah. [**Soil moisture and the condition of forest plantations on stepped terraces.**] *Lesn. Hoz.* 12 (10), 1960 (40–1). 1 ref. [Russ.]

Investigations were made in the Tashkent region on bulldozed terraces 3 m. wide, made on a S. slope of 20°, at 1300 m. alt., on a dark, heavily eroded serozem. Changes in soil m.c. to a depth of 4 m., and the survival and height growth of fruit and timber trees, were observed from early June to late Sept. It was found that these wide, stepped terraces were more effective in reducing evaporation than the narrower, local, conventional Chirchik type [not further described]; survival was better, and height growth worse, on the cut part of the wide terrace surface than on the filled part.

1378. NIKOLAENKO, V. T. Zaščita vodohranilišč Ruzskogo gidrouzla lesnymi nasaždenijami. [**Protecting the reservoirs in the Ruza hydro-electric scheme with forest stands.**] *Lesn. Hoz.* 12 (9), 1960 (31–3). [Russ.]

Discusses the value of forest stands in preventing surface run-off (and hence bank erosion and silting of reservoirs), and recommends Pine/Spruce on slightly- and medium-podzolic sandy soils; or Larch/Pine/*Tilia* on slightly- and medium-podzolic sandy-loam soils; Larch/Spruce/*Tilia* on slightly-podzolic and alluvial medium-clay-loam soils; Spruce/*Tilia* on medium-podzolic light and medium soils; Spruce/Birch on strongly podzolic clay-loam medium and heavy clay-loam soils; Willow-type gley-type stands on all very moist soils.

1379. PORTER, H. L., JR., and SILBERBERGER, L. F. **Streambank stabilization.** *J. Soil Wat. Conserv.* 15 (5), 1960 (214–6). 2 refs.

Reports on attempts during the past decade to establish a cover of stabilizing vegetation, after smoothing and sloping by bulldozer, on banks of streams in the Buffalo Creek, N.Y., catchment area, where winter floods with large ice floes are common. Shrub species tried included *Salix purpurea*, *Cornus* spp., Wichura Rose; these took 4–7 years to form an effective cover, but were efficient when used in conjunction with grass and legume seeds, which gave good cover in one growing season when fertilized, mulched (most recently with wood chips), and irrigated. Improved techniques for shrub establishment include: using rooted rather than unrooted cuttings; planting only in early spring; cutting back Willows in the nursery during the winter before spring planting; and lifting dormant Willows at the nursery very early and heeling in at the planting site.

1380. STRIFFLER, W. D. **Streambank stabilization in Michigan—a survey.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 84, 1960. pp. 14.

Data were collected and analysed from 113 untreated and 115 treated banks in 3 treated catchments and 1 untreated. The main conclusion was that bank stabilization was highly effective in stabilizing watercourses, reducing bank erosion, and increasing the density of vegetative cover.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 2076 *et seq.*, 2492 *et seq.*

1381. BAKKE, A. Utbredelsen av slekten *Dioryctria* Zell. (Lep., Phycitidae) i Norge. **[Distribution of *Dioryctria* in Norway.]** *Norsk Entomologisk Tidsskrift, Bergen* 11 (1/2), 1959 (23–30). 14 refs. [Nor.e.] I.I.E.

The four species *D. splendidella*, *D. abietella*, *D. mutatella* and *D. schützeella* were identified in a study of all available Norwegian material. *D. splendidella* and *D. mutatella* have not previously been published from Norway.

1382. STAIRS, G. R. **On the embryology of the Spruce budworm, *Choristoneura fumiferana* (Clem.) (Lepidoptera, Tortricidae).** *Canad. Ent.* 92 (2), 1960 (147–54). 11 refs. O.R.S.

1383. FRANCKE-GROSMANN, H., and SCHEDL, W. Ein orales Übertragungsorgan der Nährpilze bei *Xyleborus mascarensis* Eichh. (Scolytidae). **[An organ for transmitting nutritional fungi, in the mouth parts of *X. mascarensis*.]** *Repr.* from *Naturwissenschaften* 47 (17), 1960. pp. 3. 6 refs. [G.]

A study of ♀s from *Mimusops heckelii* showed the presence of large quantities of fungus spores (unidentified) in pockets behind the labrum and mandibles.

1384. THOMAS, J. B. **The immature stages of Scolytidae: the tribe Xyloterini.** *Repr.* from *Canad. Ent.* 92 (6), 1960 (410–9). 2 refs.

1385. WARREN, G. L. **External anatomy of the adult of *Hylobius warreni* Wood (Coleoptera: Curculionidae) and comparisons with *H. pinicola* (Couper).** *Canad. Ent.* 92 (5), 1960 (321–41). 22 refs. O.R.S.

1386. WONG, H. R., and ROSS, H. H. **New nearctic species of the genus *Pristiphora* Latreille (Hymenoptera: Tenthredinidae).** *Canad. Ent.* 92 (3), 1960 (193–8). 6 refs. O.R.S.

Short descriptions of 10 new species.

1387. VOCKEROTH, J. R. **Taxonomy of the genus *Cecidomyia* (Diptera: Cecidomyiidae) with special reference to the species occurring on *Pinus banksiana* Lamb.** *Canad. Ent.* 92 (1), 1960 (65–79). 23 refs. O.R.S.

The genera *Retinodiplosis* and *Stelechodiplosis* are treated as subjective synonyms of *Cecidomyia.* The genus is redescribed. Three new species known to occur on *Pinus banksiana* are also described. *From author's summary.*

15. Animal Ecology. Game and Fish Management. Hunting, Shooting and Fishing

See also Nos. 1592, 2065 *et seq.*

1388. TURNBULL, A. L. **The spider population of a stand of Oak (*Quercus robur* L.) in Wytham woods, Berks., England.** *Canad. Ent.* 92 (2), 1960 (110–24). 8 refs. O.R.S.

Presents the results of a study of the abundance, species composition and distribution of spiders in an arbitrarily delimited area of woodland. Two peaks of population abundance occurred, one in mid-summer and one in October. Population density of the ground zone is twice that of the field layer, and 8 times that of the canopy layers. *From author's summary.*

1389. HEATWOLE, H. F. **The forest floor and its utilization by selected species of terrestrial amphibians.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (2), 1960 (380). O.R.S.

Eleutherodactylus spp. were studied in Venezuelan cloud forest, *Rana sylvatica* in Oak/Hickory and swamp hardwood forests in S. Michigan, and *Plethodon cinereus* in Beech/Maple and Oak/Pine/Aspen forests in N. Michigan. The characteristics of the surface litter and humus layers (thickness, structure, moisture content, etc.) of each forest type are described and are related to the occurrence and survival of the amphibians.

1390. CONDRY, W. **The breeding birds of conifer plantations.** *Quart. J. For.* 54 (4), 1960 (357–62).

This article is based on observations made in north and central Wales from sea level to moorland, mainly in Forestry Commission plantations. It sketches the general picture of a forest in its earliest stages supporting very few birds but growing through several stages in which birds are plentiful and eventually, at near-maturity, showing a much decreased bird population, but nevertheless one that is much more numerous than that originally supported by the moorland. *Author's summary.*

1391. HOFFMAN, G. R. **The small mammal components of six climax plant associations in eastern Washington and northern Idaho.** *Ecology* 41 (3), 1960 (571–2). 13 refs.

Using the methods of Rickard [cf. *F.A.* 21 No. 4004], a further 6 plant associations in the forest zone were studied. Four additions were made to the list of mammal species known to inhabit climax communities, and the known vegetational preferences of others extended. In a test made in two parts of the same stand, the sampling methods yielded closely similar results. *From author's summary.*

1392. HALL, J. G. **Willow and Aspen in the ecology of beaver on Sagehen Creek, California.** *Ecology* 41 (3), 1960 (484–94). 18 refs.

Two pairs of beaver, introduced on Sagehen Creek, Nevada County, in 1945, had increased to ca. 30 animals distributed in 5 colonies by 1955. The interaction between beaver and their two chief food and building resources, Willow and Aspen, was studied on 3 colonies for 3 seasons. Aspen was preferred and cut first; as it was used up, more and more Willow was taken. Though choice of size of Aspen stem depended primarily on availability, a slight but significant (at the 0·01 level) preference was noted for trees in the 2-in. diameter class, probably because of their superiority as building material rather than as a food source. Willow was more tolerant of the inroads of beaver than Aspen; even so, sprouting vigour eventually declined, and the rate of growth fell behind the rate of harvest. The beaver then moved up or down stream, allowing the original area to recover. [Cf. *F.A.* 17 No. 105.]

1393. EDWARDS, R. Y., SOOS, J., and RITCEY, R. W. **Quantitative observations on epidendric lichens used as food by caribou.** *Ecology* 41 (3), 1960 (425–31). 7 refs.

Caribou in Wells Gray Park, British Columbia, appear to be dependent on epidendric lichens, *Alectoria* spp., for food in winter. The total lichen load, as calculated from sample trees in 4 study areas, ranged from 114 to 1332 kg./acre, oven-dry weight; the latter value was from forest near the timberline. Studies of the vertical distribution of loads on the tree and the % composition and ecological differences of *Alectoria* spp. are discussed.

1394. BUKIĘWICZ, H. Wierzby krzaczaste jako żer dla zwierzyny. **[Shrub Willows as browse for game.]** *Las Polski* 34 (17), 1960 (11–2). [Pol.]

Discusses food preferences, concluding that *Salix adenophylla* and *S. hastata* are the most sought-after species and that their planting will be beneficial.

16. General Botany

160. Plant Chemistry

See also Nos. 1333–5, 1344, 1406, 1408–9, 1412, 1523–7, 1547–8, 1739, 1888, 1962, 1968, 2064, 2386 *et seq.*, 2582 *et seq.*

1395. ORMAN, H. R., and WILL, G. M. **The nutrient content of *Pinus radiata* trees.** *N.Z. J. Sci.* 3 (3), 1960 (510–22). 13 refs.

Samples of needles, branches, bark and wood of 8 trees were analysed for N, P, K and Ca. In the bark, N, P and K contents increased and Ca content decreased with increasing height in the stem. In the wood, the greatest concentrations of N, P and K were found in the outer ring of the sapwood and in the heartwood transition zone near the top of the tree; Ca contents were highest in the sapwood. In a mature tree, the crown (branches plus needles) contains < 10% of the total dry matter and <40% of the total nutrient content. Thus greater quantities of nutrients are removed from a clear-felled site than remain in the slash, which contains 19% of the Ca, 29% of the K, 36% of the P and 42% of the N in the crop.

161. Physiology

See also Nos. 1417, 1422, 1515 *et seq.*, 1737–42, 1760, 1771–2, 1951, 1996, 2177, 2181, 2337–9, 2342–4, 2346, 2349, 2351, 2646.

1396. UEDA, K. **Studies on the physiology of Bamboo, with reference to practical application. Reference data No. 34.** Resources Bureau, Science and Technics Agency, Prime Minister's Office, Tokyo. 1960. pp. xii + 167 + 2 plates. [E.]

An exhaustive study of the world distribution and uses of the 47 genera of Bambusaceae, dealing with: (1) physiology, (2) development, i.e. culm and rhizome growth, propagation, chemical composition, size and quality of culm, etc., (3) flowering and death, (4) cytogenetics, (5) methods of cultivation, harvesting etc.

1397. SLATYER, R. O. **Absorption of water by plants.** *Bot. Rev.* 26 (3), 1960 (331–92). 15 pp. of refs.

A supplement to Kramer's review [see *F.A.* 7 No. 590] under the main heads: terminology and units; processes and mechanisms; factors affecting water absorption; and absorption of water by leaves and other aerial organs.

1398. LADEFOGED, K. **A method for measuring the water consumption of larger intact trees.** *Physiol. Plant., Copenhagen* 13 (4), 1960 (648–58). 23 refs. [E.e.]

An expanded description of a method and supporting experiments used in work already noticed [cf. *F.A.* 19 No. 79].

1399. FENSOM, D. J. **Transport rate changes in excised stems of Maple induced by applied electromagnetic forces: the "flushing" effect.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (113–4). O.B.D.

When 2-month-old excised stems of *Acer saccharum* were subjected to applied direct-current potentials of 0·1–0·5 volts, it was found that transpiration rates into the stem could be altered. Under certain conditions, after a period of exposure to light, the rate of flow suddenly increased in the stimulated stem by a factor of 10 for a period of ca. 5 min. before returning to normal. After one discharge it was not possible to activate the flow again before re-exposing the stem to light. This effect is discussed in relation to the electrokinetic theory of transport in plants.

1400. Zimmerman, M. H. **Longitudinal and tangential movement in the phloem of White Ash (*Fraxinus americana* L.).** *Abstr.* in *Plant Physiol.* 35 (*Suppl.*), 1960 (iv). O.R.E.

[Cf. *F.A.* 20 No. 102.] Samples of sieve-tube exudate, taken one after the other from a single bark incision, decrease continuously in concentration. When an incision is made laterally adjacent to another and a short time apart, the first one has no effect on the exudate concentration of the second. Longitudinally, however, incisions into the phloem affect the exudate concentrations over great distances. A circular incision at a height of 5 m. causes, within one hour, a decrease of concentration below and an increase above. A concentration maximum develops 50 cm. above the circular incision within a short time (ca. 30 min.), then moves up to ca. 1 m. above the incision and persists. It can still be found a year later in the presumably new phloem tissue. This concentration maximum in the sieve-tube exudate is not identical with the classical pile-up of substances above a girdle; the latter reflects excessive tissue immediately above the girdle. One-half defoliation of Y-shaped trees showed, in confirmation of earlier results, that sucrose and D-mannitol accumulate in the sieve tubes in the absence of leaves and that tangential conduction in the phloem is extremely slight. Phloem conduction from the leafy side fanned out at an angle <1°.

1401. Hill, G. P. **Seasonal variation in sieve-tube activity and sugar content of sieve-tube sap in *Tilia americana*.** *Abstr.* in *Plant Physiol.* 35 (*Suppl.*), 1960 (iv). O.R.E.

Using the large aphid *Longistigma caryae* and employing the aphid stylet method of collecting sap, it has been possible to study sieve-tube activity and sugar content of sieve-tube sap during various periods, including some, e.g. dormancy and bud break, not usually amenable to other methods of investigation. Detached branches were used during the periods of true and induced dormancy. Activity of sieve tubes depends on a source and sink of solutes. During certain periods, such as true dormancy, exudation from branches of *Tilia americana*, brought into a warm room and given an extended photoperiod, occurs only for a short time, indicating failure of the source to supply solutes at a sufficient rate to maintain the turgor of the sieve tubes. Possible factors involved, including direct or indirect influence of growth-regulator, are discussed. Sugar concentrations show well-defined variations, particularly with respect to the oligosaccharides; these are also discussed.

1402. Hill, G. P. **Sieve tube/storage cell relations revealed by the aphid technique.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2*A*, 1959 (15–6). O.B.D.

Experiments with *Salix* sp., using the aphid technique, indicate that when solute supplies from the leaf to the sieve tube are cut off, the storage cells immediately take over the function of supplying them. This is supported by the fact that exudation can be obtained from lengths of stem and strips of bark as well as from whole plants. Experiments using solutions in contact with the bark indicate a high resistance of sieve tubes to plasmolysis, which must be important in maintaining translocation when high water tensions are present in the xylem.

1403. Lieth, H. von, and Vogt, M. Der Lichtkompensationspunkt einiger Waldschattenpflanzen im Sommer und im Frühjahr. **[The light compensation point of some forest shade plants in summer and spring.]** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (227–8). [G.] O.B.D.

The light compensation point (l.c.p.) was measured in 20 different plants, mainly herbaceous, but including also *Carpinus betulus*, *Fagus sylvatica*, and *Prunus padus*. In all species the l.c.p. was reached at relatively high illumination (800–1000 luxes) in spring, before flushing. During flushing, which began at the beginning of May and lasted over 3 weeks, values sank to 100–200 luxes, and remained relatively stable until the end of July, when measurements ceased. Night respiration rates of all species studied changed in the same way as the l.c.p. The drop in l.c.p. during flushing is therefore primarily dependent upon a drop in respiration rate. [Cf. *F.A.* 20 No. 2767.]

1404. Polster, H., and Fuchs, S. Der Einfluss intermittierender Belichtung auf die Transpiration und Assimilation von Fichte und Lärche bei Dürrebelastung. Untersuchungen mit dem CO_2- und Wasserdampf-URAS. **[The influence of intermittent illumination on the transpiration and assimilation of Spruce and Larch under drought conditions. Investigations with the CO_2 and water-vapour infra-red-absorption recording instrument.]** *Biol. Zbl.* 79 (4), 1960 (465–80). 20 refs. [G.g.] E.M.B.

Measurements were made of transpiration, assimilation and respiration under conditions of gradually decreasing or increasing water supply and with short-term alternating dark and light periods. The plants responded to intermittent light with fluctuations in their transpiration rate according to the movement of the stomata. The transpiration reaction to intermittent light can therefore be considered a function of the plant's capacity to regulate stomatal activity. With a continuously decreasing water supply, however, the photo-active opening movement of the stomata was increasingly offset by their hydroactive closing mechanism, and the effects were reflected in the amounts of water given off, and in the range of the fluctuations. When the water supply was gradually restored, the process was reversed. The better the capacity of the plant to regulate the stomata, and the wider the fluctuations under intermittent light, the more vigorous the plant. Near permanent wilting point, transpiration ceased completely in the dark. Assimilation under intermittent light and increasing drought gradually decreased until net assimilation became nil. Respiration, on the other hand, was affected only in the first phases of the dark periods. Since the cessation of transpiration in the dark and of net assimilation took place at the point where the plant had suffered 5% of irreversible damage to its assimilatory organs, these two indications can be used as criteria of the stage when the plant is suffering from a near-lethal water deficiency.

1405. DADYKIN, V. P., ALEKSEEVA, T. A., and DAVYDOVA, JU. A. O različijah v pogloščenii sveta rastenijami otkrytogo i zaščiščennogo grunta. **[Differences in the absorption of light by plants in the open and in glasshouses.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (105–13). 15 refs. [Russ.]

Presents graphs showing absorption, reflection, and transmission of light for *Corylus avellana* and *Tilia cordata* in the open and in an unheated glasshouse in the Kola peninsula [cf. *F.A.* 21 No. 4024]. Most of the article, however, refers to similar work on the leaves of tomatoes.

1406. LEMÉE, G. Sur la teneur en chlorophylle et ses variations dans les feuilles des espèces ligneuses de la zone de forêt hygrophile en Côte-d'Ivoire. **[Chlorophyll content and its variations in leaves of woody species of the Ivory Coast rain forest.]** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (221–2). [F.] O.B.D.

The chlorophyll content of trees and shrubs of the Ivory Coast rain forest, whether measured in relation to dry weight or to surface area, shows no connexion with their heliophilous or sciophilous character. The development of chlorophyll (estimated per unit surface area) is different, however, in the two types of plant. In heliophytes (e.g. *Musanga smithii*), the rise in chlorophyll continues longer and reaches a higher content in sun leaves, while in sciophytes (e.g. *Cola gabonensis*) the reverse is true. If, during the building-up phase, light is increased, pigment content also increases in heliophytes but decreases in sciophytes. When light is decreased, the process is reversed. Thus the distinction between species with photostable and photolabile chlorophyll, established in Europe, also holds good for equatorial woody species, where it is connected with their reaction to illumination. The ratio of chlorophylls *a*/*b* shows generally higher values in exposed positions, but a transition to light from shade lowers this ratio either by a more rapid destruction of *a* (sciophytes), or a more rapid production of *b* (heliophytes).

1407. NEUWIRTH, G., and POLSTER, H. Wasserverbrauch und Stoffproduktion der Schwarzpappel und Aspe unter Dürrebelastung. **[Water consumption and matter production in Black Poplars and Aspen under drought conditions.]** *Arch. Forstw.* 9 (9), 1960 (789–810). 17 refs. [G.g.russ.e.]

Under drought conditions in June, when much of the foliage of 5-year-old Black Poplar hybrids on dry, sandy loam at Graupa had yellowed or dropped, transpiration and assimilation in a *Populus* × *vernirubens* was little below normal, while in Aspen, which had remained green throughout, transpiration was greatly restricted and net assimilation had ceased. Two or three days after a pair of trees had been well watered, transpiration of Aspen equalled, and assimilation exceeded that of *P.* × *vernirubens*. Under adequate moisture conditions, the Black Poplar was more active on fine days and the Aspen on cool, cloudy days. Economy of matter production as expressed in the H_2O/CO_2 ratio was slightly greater for Black Poplars but, in general, findings supported ecological observations on the greater suitability of Aspen for dry sites.

1408. BÖRNER, H. **Liberation of organic substances from higher plants and their role in the soil sickness problem.** *Bot. Rev.* 26 (3), 1960 (393–424). 182 refs.

A literature review dealing chiefly with papers in which isolated substances from higher plants could be identified or classified within a definite group of substances. The main heads are: root excretions; liberation of organic compounds from seeds and fruits; liberation of organic compounds from plant residues; excretions from leaves; and the role of excreted organic compounds in the interaction of higher plants. The need for further research is urged.

1409. SANADZE, G. A., and DOLIDZE, G. M. K voprosu o himičeskoj prirode letučih vydelenij list'ev nekotoryh rastenij. **[The chemical nature of the volatile secretions of the leaves of certain plants.]** *Dokl. Akad. Nauk SSSR* 134 (1), 1960 (214–6). 4 refs. [Russ.] A.P.B.

Tabulates results of mass-spectrometric investigations of volatile organic substances given off by the leaves of *Salix alba*, *Populus simonii* and *P. sosnowskii* sampled in the autumn. These confirmed findings from gas-chromatographic analysis, on the presence in these secretions of CH_4, C_2H_6, C_3H_8, C_4H_{10} and heavier compounds.

1410. JABLOKOV, A. S. O stadijnoj razvitii lesnyh drevesnyh porod. **[The stadial development of woody forest species.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (33–61). [Russ.russ.]

Following Lysenko, the author considers that the annual stadial development of 1-year seedlings or shoots is the same as that of annual herbaceous plants. From a study of several Aspen forms, the following conclusions are drawn: the flower and vegetative buds, like annual herbaceous plants, complete the vernalization stage every year; the type of stadial development of the buds is hereditary and differs in various forms of Aspen at the same location and still more at different locations; the type of stadial development should be considered in breeding work; shoots for grafts or for hybridization work should be prepared and dispatched in the latter half of winter, and if that is impossible, they should be sent early in the winter and kept at a low temperature to force the buds to complete the vernalization stage.

1411. ROBBINS, W. J. **Juvenility in trees and shrubs.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (328–9). O.B.D.

The apical meristems are the sites in which the stages from juvenility to the adult state originate. Juvenility appears to be an unstable metabolic state which proceeds through a series of steps to the relatively steady state of the adult meristem. The latter may be reversed towards juvenility by treatment with cold, X-rays, gibberellic acid, severe pruning, products from the juvenile state, formation of adventitious meristems, formation of nucellar embryos, and by sexual reproduction. It is suggested that the two kinds of meristem differ in possessing particular metabolites that determine the metabolic systems responsible for the differences in physiology and morphology.

1412. Westing, A. H. **Asymmetric distribution of a substance found in horizontally displaced Eastern White Pine leaders which reacts with Salkowski reagent.** *For. Sci.* 6 (3), 1960 (240–5). 17 refs.

A substance reacting with Salkowski reagent (acidified $FeCl_3$), possibly an indole compound but not IAA, was discovered in aqueous extracts of terminal shoots of *Pinus strobus*. The apical region of the leader, but not the leaves, was found to control the amounts of this substance. When tip regions were excised, neither NAA nor gibberellic-acid applications proved to be substitutes for this control. Total amounts of the substance diminished as the growing season advanced. The substance is of particular interest, because unilateral geotropic stimulation (bending a leader to one side) resulted in transverse redistribution, with 60% of the substance in the lower horizontal half of the stem. This occurred also in decapitated leaders, but not when NAA was applied.

1413. Allen, R. M. **Changes in acid growth substances in terminal buds of Longleaf Pine saplings during the breaking of winter dormancy.** *Physiol. Plant., Copenhagen* 13 (3), 1960 (555–8). 8 refs. [E.e.]

The greatest changes in ether-soluble acid growth-substances were an increase in the amount of a growth promoter that appeared similar to IAA when examined chromatographically, using isopropanol/ammonia/water as the solvent, and a decrease of an inhibitor similar to inhibitor-β [cf. *F.A.* 20 No. 1442]. The results showed that the acid growth promoters and inhibitors regulate the winter rest period of *P. palustris*, or are closely connected with its regulation.

1414. Osborne, D. J., and Hallaway, M. **Auxin control of protein-levels in detached autumn leaves.** *Nature, Lond.* 188 (4746), 1960 (240–1). 11 refs.

Attention has already been drawn [cf. *F.A.* 20 No. 4150] to the importance of growth regulators in the control of physiological changes occurring during the autumn senescence of both attached and detached leaves. Further, more detailed investigations have revealed that the total-protein values in the treated areas of the leaf may be wholly maintained for periods of >2 weeks, during which time the total protein in control leaves and untreated parts of the treated leaf may fall to half the original values. Possible explanations are discussed.

1415. Fensom, D. S. **A note on electrical resistance measurements in *Acer saccharum*.** *Canad. J. Bot.* 38 (2), 1960 (263–5). 3 refs. O.R.S.

The electrical resistance of a Maple branch at the depth of the cambial layer was plotted against air temperature, and a good correlation was found between the two factors. Correlations appeared to follow each other in steps, the first associated with very cold weather and high resistance. Later steps were initiated by warm periods and were associated successively with sap flow, opening of buds, etc. [Cf. *F.A.* 22 No. 1399.]

163. Embryology

1416. Herr, J. M., Jr. **The development of the ovule and megagametophyte in the genus *Ilex* L.** *J. Elisha Mitchell Sci. Soc.* 75 (2), 1959 (107–28). 17 refs. L.S.

164. Morphology

See also Nos. 1453–4, 1465, 1501, 1561–2, 1969.

1417. Sinnott, E. W. **Plant morphogenesis.** McGraw-Hill Book Company, Inc., New York, Toronto, London. 1960. pp. x + 550. 65 pp. of refs. Price £4. 17*s*.

Part I of the work, designed primarily for reference, discusses growth, emphasizing descriptive and experimental work on cells and meristems; Part II, the morphogenetical phenomena of correlation, polarity, symmetry, differentiation, regeneration, tissue mixtures, and abnormal growth; and Part III, morphogenetic factors, including light, water, temperature, various other physical factors, chemical factors and growth substances and genetic factors, with a final chapter on the basic problem of organization.

1418. Metcalfe, C. R. **Anatomy of the Monocotyledons. I. Gramineae.** Clarendon Press, Oxford. 1960. pp. lxi + 731. 21 pp. of refs. Price £4. 4*s*.

The first of a series of companion volumes to the *Anatomy of the Dicotyledons* [cf. *F.A.* 12 No. 354], listing in alphabetical sequence (separately for Bambuseae and others) the microscopical characters of 345 genera and their species. The list is preceded by notes on morphology, leaf structure, taxonomy and microscopical characters of the grass plant, and followed by a table and list indicating in which species or genera certain characters occur, and 29 plates of anatomical drawings.

1419. Yamashina, K. **[On the spiral growth of the root of Akamatsu (*Pinus densiflora* Sieb. et Zucc.).]** *J. Jap. For. Soc.* 40 (12), 1958 (517–8). 2 refs. [Jap.]

A study of 9 trees, from 3 to 16 years old, in which the roots were examined from 15 to 400 cm. down, using injections of acid magenta. In one 3-year-old plant, spirality of 100° was found in a root length of 15 cm.; in a 7-year-old plant, 360° in 54 cm.; and in 16-year-old plants, 326° in 255, 360° in 120 and 720° in 400 cm. In only one plant, a 16-year-old, was a reversal of spirality found in the root; this occurred over a root length of 210 cm. In all other cases, the spirality was entirely left-hand.

1420. Jackman, V. H. **The shoot apex of some New Zealand gymnosperms.** *Phytomorphology* 10 (2), 1960 (145–57). 21 refs. O.B.D.

Describes the vegetative apex of *Dacrydium biforme*, *Libocedrus plumosa*, *Phyllocladus trichomanoides*, *Podocarpus totara* and *Agathis australis*.

1421. Ėrpert, S. D. Osobennosti rosta godičnyh pobegov vjaza melkolistnogo (*Ulmus pinnato-ramosa* Dieck). **[Features of the growth of annual shoots of *U. pumila* var. *arborea*.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (88–104). 35 refs. [Russ.]

Reports on phenological and morphological observations at Dzhanybek, in 1954–56, on the prolonged growth of the annual shoots, the growth of axillary buds in the same year and the formation of sylleptic shoots of two or more orders, etc. The author inclines to the view that this tree is a mutant of *U. pumila* selected by man.

1422. Melville, R. **A metrical study of leaf-shape in hybrids: II. Some hybrid Oaks and their bearing on Turing's theory of morphogenesis.** *Kew Bull.* 14 (2), 1960 (161–77). 13 refs.

A study was made of leaf-shapes of the F_1 hybrid (*Q.* × *lucombeana*) between *Quercus cerris* and *Q. suber* and of a particular F_2 hybrid of the same parentage (*Q.* × *l.* var. *diversifolia*). In the F_1 hybrid, graded interaction, with change of dominance between the parental effects, was observed along the leaf-axis. The F_1 hybrid leaf is narrower than the theoretical intermediate and the lateral nerves are skewed upwards: reasons for these effects are discussed. Suppression of the lamina to varying extents occurred in the F_2 hybrid; a sine-wave theory of leaf morphogenesis is proposed to account for these effects. The relationship between this sine-wave theory and Turing's diffusion-reaction theory of morphogenesis is discussed. *From author's summary.*

1423. Critchfield, W. B. **Leaf dimorphism in *Populus trichocarpa*.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (82). O.B.D.

Early and late leaves of *P. trichocarpa* differ in many features of external morphology, including petiole length, occurrence and size of marginal glands, thickness, coarseness of the visible venation network, and stomatal distribution. This type of dimorphism has its origins in a fundamental difference in leaf ontogeny. The early leaves over-winter in the bud as well developed embryonic leaves whose major features are already delineated. The first late leaves are also present in the winter bud, but as arrested primordia. Succeeding late leaves develop uninterruptedly from initiation to maturation during the growing season. The expansion of the pre-formed early leaves is almost completed by late spring when the first late leaves begin to grow rapidly. The formation of late leaves may then continue until late in the season. Little stem elongation occurs during early-leaf development. Not until the first late leaves expand does rapid elongation commence, and then it is restricted to shoots producing late leaves. Consequently, the early leaves are confined to short shoots and the base of long shoots; first-year coppice shoots and the upper part of long shoots bear only late leaves.

1424. Neubauer, H. F. Über das Blatt von *Swietenia macrophylla* King. **[The leaf of *S. macrophylla*.]** *Ber. Dtsch. Bot. Ges.* 73 (7), 1960 (277–88). 8 refs. [G.g.] O.B.D.

Traces the morphological development of the leaves of *S. macrophylla* from the early seedling stage to maturity.

1425. Hall, B. A. **Inflorescences in the Aceraceae.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (148–9). O.B.D.

A revision of concepts, based on careful anatomical observation, is necessary for the understanding of inflorescences. Such a study has been made in the Aceraceae, which include a wide variety of inflorescence types within a group of closely related species. The usual distinction between racemose and cymose inflorescences does not fit the data of this study. The simple raceme of *Acer grosseri*, for example, has a terminal flower and lacks the acropetal sequences of anthesis. A more valid distinction is that between monopodial and sympodial branching, but this does not separate the inflorescences into two types, since in *A. mono* the primary branching of the inflorescence is monopodial but these branches are in turn sympodially branched, forming bostryches. Further complexities involve the various patterns of distribution of ♂ and ♀ flowers in the inflorescences. The Aceraceae confirm the view that simpler inflorescence types have been derived phytogenetically from more complex ones through loss of branches and the shortening of internodes. The present data can contribute to an understanding of phylogenetic relations within the Aceraceae, as well as of the nature and evolution of inflorescences in general.

1426. Copeland, H. F. **The reproductive structures of *Schinus molle* (Anacardiaceae).** *Madroño, S. Francisco* 15 (1), 1959 (14–24). E.B.

1427. Copeland, H. F. **The reproductive structures of *Fraxinus velutina* (Oleaceae).** *Madroño, S. Francisco* 15 (6), 1960 (161–72). 30 refs. E.B.

This study, and a comparison with the literature, tend to substantiate the naturalness of the family Oleaceae and the order Contortae.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 1396, 1422, 1475–6, 1481, 1486, 1492–3, 1494, 1514, 1516, 1563, 1692–5, 1767, 1828, 1861, 2411–3.

1428. Matthews, J. D. **Forest tree breeding in Britain.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (16–21). 12 refs.

1429. Satoo, T. **A brief report on forest tree improvement in Japan.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (24–6).

Deals chiefly with *Cryptomeria japonica*.

1430. Lines, R. **Studies of the indumentum of young shoots of Norway Spruce in some Scottish

provenance experiments. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (170–8). 14 refs.

Investigation of the indumentum of Norway Spruce in provenance trials at the Bin Forest, Aberdeenshire, showed that 3 main groups of provenances can be separated by the hairiness of the young shoots, those from the Alps and S.E. Europe being markedly glabrous, those from the Baltic and N. Europe markedly hairy, and those from the Carpathian-Hercynian region intermediate. Statistical analysis of the results showed that if 150 young shoots of a provenance are scored for hairiness, the group from which it comes can be determined. A significant correlation was also found between seed weight and the shoot indumentum.

1431. Pravdin, L. F. Osnovnye zakonomernosti geografičeskoj izmenčivosti sosny obyknovennoj (*Pinus silvestris* L.). **[Basic trends in the geographical variability of *P. sylvestris*.]** In *Voprosy lesovedenija i lesovodstva.* Moscow. 1960. pp. 245–56. [Russ.E.]

A survey of evidence of its variability (e.g. needle life, needle structure, cone size, oil content of seeds, photoperiodism, etc.), in the U.S.S.R.

1432. Gerhold, H. D. **Seasonal yellowing of Scotch Pine—its implications for the genetic improvement of Christmas trees.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (43–7). 13 refs.

Discusses information available on the causes of seasonal yellowing, with summaries of recent studies [cf. *F.A.* 21 Nos. 66, 1569], and makes suggestions for a breeding and improvement programme based on the geographic variation of the species [cf. *F.A.* 18 No. 2495] and the high heritability of its needle colour. Research already begun is referred to.

1433. Squillace, A. E., and Dorman, K. W. **Selective breeding of Slash Pine for high oleoresin yield and other characters.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (375). O.B.D.

Pinus elliottii progenies, produced at the Lake City (Fla.) Research Center from both controlled and wind pollinations, are now 13 years old and have been tested for resin-yielding capacity. Inheritance of this character was demonstrated and heritability estimates computed. This information, along with a separate study of the natural phenotypic variation of this character, provided a basis for estimating the theoretical degree of improvement possible through (1) continuous selection and breeding, and (2) progressive establishment of seed-production areas. The pros and cons of both of these methods are pointed out. Seed orchards using vegetative propagules of selected first generation progenies of proven parents are also being set up. The same breeding work permitted some less intensive studies of inheritance of other characteristics, the results of which are briefly discussed. Among these, the variation and inheritance of gum viscosity, gum exudation pressure, tracheid length, and stem deformities were demonstrated.

1434. Callaham, R. Z. **Temperature and seed germination for races of Ponderosa Pine.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (57–8). O.B.D.

Half-sib progenies from 20 sources were germinated at 5 constant temperatures. The sources sampled much of the range of Ponderosa Pine in the western U.S.A. Rates of germination were determined at 8°, 16°, 24°, 30° and 36° C. Significant regional and local differences in germinative energy and germinative capacity were readily detected at most temperatures. The interior sources, particularly those from Nebraska, germinated most rapidly at all temperatures, and the majority showed optimum germinative energy at lower temperatures than coastal and Pacific Northwest sources. Germinative capacity of nearly all sources was generally reduced at the highest temperature.

1435. Irgens-Moller, H. **Localized genotypic variation in Douglas Fir (*Pseudotsuga menziesii* (Mirb.) Franco).** *Abstr.* in *Bull. Ecol. Soc. Amer.* 41 (2), 1960 (48). A.P.B.

Germination of Douglas Fir seed collected from pairs of adjacent N. and S. slopes near Corvallis, Oregon, varied with the aspect. Seed from S. aspects consistently germinates faster than seed from adjacent stands on N. aspects. This difference in speed of germination is greater when the seed is unstratified and germinated at 20° C. during the night and 30° during the day, than when stratified and germinated at lower temperatures. Older seedlings native to the Corvallis area and seedlings native to the Coast Range 25 miles west differed strikingly in growth rate when grown together at Corvallis. The Corvallis seedlings began growth a month earlier than those from the Coast Range, but the latter had a significantly greater growth rate. The early growth initiation of the Corvallis seedlings may be a result of natural selection for early completion of growth in order to avoid the early and severe summer droughts characterizing the Corvallis area.

1436. Wommack, D. E. **Effect of winter chilling and photoperiod on growth resumption in Douglas Fir (*Pseudotsuga menziesii* (Mirb.) Franco).** *Abstr.* in *Bull. Ecol. Soc. Amer.* 41 (2), 1960 (57–8). A.P.B.

Experiments with grafts of 16 selected trees 30–40 years old, along an E.-W. transect from the Oregon coast at Yachete to the crest of the Oregon Cascades in the Santrai Pass area, showed that plants from high elevations or areas characterized by severe winters require longer exposure to winter conditions for normal resumption of growth than those from low elevations with mild winters. Considerable local genetic variation seems to exist. Exposure to long days compensated to some extent for lack of adequate chilling.

1437. Schönbach, H. Die Variation der Frostresistenz in "einheimischen" Beständen der grünen Douglasie (*Pseudotsuga menziesii* (Mirb.) Franco). **[Variations in frost resistance in "native"**

stands of *P. taxifolia* var. *viridis*.] *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (347–8). [G.] O.B.D.

Progeny raised in 1948 from open-pollinated trees in 3 stands of the Tharandter Wald (now ca. 80 years old) showed, even as 1-year-old seedlings, marked differences in early frost resistance. In longer-term trials the resistant progeny, in general, continued to be frost-hardy and the others susceptible to winter frost. The value of this character for early selection of frost-resistant strains is discussed. [Cf. *F.A.* 19 No. 1380.]

1438. Jaynes, R. A. **Status of Chestnut breeding at the Connecticut Agricultural Experiment Station.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (27–31). 7 refs.

Current research to find replacements for *Castanea dentata* (largely destroyed by *Endothia parasitica*) includes basic studies on hybridization, interspecific crossability, and pollen. The progress of *C. mollissima* and selected hybrids planted in 1947–55 [cf. *F.A.* 15 No. 3752], the problems of vegetative propagation of *Castanea* spp., and the search for resistant native trees are outlined. [Cf. *F.A.* 17 No. 145.]

1439. Matthews, J. D. **The flowering of some clones of Beech (*Fagus sylvatica* L.).** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (255). [E.] O.B.D.

In Britain, Beech does not normally flower until 20–30 years from seed. Flowering is also markedly periodic. The flowering of 13 clones of Beech (produced by grafting scions from adult trees on to juvenile rootstocks) has been observed in order (*a*) to determine their flowering behaviour, (*b*) to devise methods to bring grafts into flower quickly, and (*c*) to establish seed orchards. There is great variation between clones both in time of first flowering and in the quantity of ♂ and ♀ flowers produced. One clone flowered in the third season after grafting; 4 have flowered from the fourth season; 3 have not yet flowered 8 seasons after grafting. One clone of 9 plants produced >1500 ♀ flowers in 1958. Many flowers of both sexes are borne on "short shoots" situated in the lower and middle parts of the crown. The flowering of most grafts has tended to be biennial, but one graft has produced a few flowers each year since 1954. Partial stem girdling done in May 1957 resulted, with some exceptions, in increased production of flowers in 1958. Some proposals for establishing seed orchards of Beech are derived from these studies. The importance of co-operation between tree physiologists and tree breeders is emphasized.

1440. Morville, K. Karpaterbøgens udspringstid. **[Flushing date of Carpathian Beech.]** *Dansk Skovforen. Tidsskr.* 45 (8), 1960 (324–30). [Dan.]

Observations over 3 years in the Tisvilde–Frederiksværk district showed that most trees of Carpathian origin flushed up to 10 days earlier than those of Danish origin, but some only 1–2 days earlier. Dutch and Belgian provenances flushed later than the Danish ones. Danish literature on the subject is briefly discussed.

1441. Rostovcev, S. A. Klimatičeskie ėkotipy duba čereščatogo v evropejskoj časti SSSR. **[Climatic ecotypes of *Quercus robur* in European Russia.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (62–94 + 1 map). 1 ref. [Russ.]

Discusses phenology, morphology, frost resistance, rates of growth etc., and on this basis distinguishes ten geographical forms (climatic ecotypes) of Oak: I—north-western; II—northern; III—north-eastern; IV—western; V—south-western; VI—central; VII—eastern; VIII—S. Ukrainian; IX—south-eastern; and X—S. foothill. The areas of these ecotypes are demarcated on a map, and recommendations are made on the possibility or otherwise of using acorns from each area in the other areas.

1442. Vaartaja, O. **Ecotypic variation of photoperiodic response in trees, especially in two *Populus* species.** *For. Sci.* 6 (3), 1960 (200–6). 18 refs.

Growth data for *Populus tremuloides* (*a*) and *P. deltoides* (*b*) seedlings grown under artificially varied day-lengths are tabulated to compare responses of northern and southern provenances. Treatments found critical for the inhibiting of growth [cf. *F.A.* 21 No. 208] are presented, the critical day and night lengths corresponding roughly to those of the season when increasing cold inhibits growth. They suggest that these photoperiodic ecotypes have evolved in response to the need to make the fullest safe use of the growing season, consistent with preparations to resist early frost and winter cold. The greater weight of the root-system of the northern Aspen is regarded as a genetic adaptation to cold soils.

1443. **Poplar investigations.** *Extr.* from *Report, Soil Conservation and Rivers Control Council, Wellington 1958/1959*, 1959 (26–9). C.G.B.

A cross between a ♂ *Populus yunnanensis* and ♀ *P. deltoides* cv. *virginiana* was found on a road cutting in New Zealand. The hybrid showed remarkable vigour in the nursery. In monthly planting trials with unrooted poles, best survival and growth resulted from July and early August plantings. Isolated cases of attack by the long-horned tree borer *Oemona hirta* on *P. nigra* var. *italica* and *P.* × *generosa* have been reported.

1444. Bondarenko, N. I. Gibridizacija topolej i iv na okorenennyh vetkah. **[Hybridization of Poplars and Willows on rooted cuttings.]** *Lesn. Hoz.* 12 (8), 1960 (33–4). [Russ.]

A general account of the technique, which is claimed to give better results than hybridization on cut shoots stood in water.

1445. Kopecky, F. Experimentelle Erzeugung von haploiden Weisspappeln (*Populus alba* L.). **[Experimental production of haploid White Poplars.]** *Silvae Genet.* 9 (4), 1960 (102–5). 27 refs. [G.g.e.f.]

Haploid White Poplar seeds were produced by (1) pollinating flowers of *P. alba* with pollen of weakened viability originating from *P. tremula*, and (2) crossing *P. alba* and *P. nigra*. In (1) only 0·2% of the catkins produced seeds. In (2) nearly all catkins produced seeds, but only 3·2% of them were viable. The haploid White Poplars grew slowly; in 2 years they did not attain the size of a 1-year-old diploid plant. The leaves are only ⅓ the size of those of diploid plants, the laminae are thinner, and the epidermal cells and stomata only ½ the size of those of diploid plants.

1446. May, S. Prime osservazioni sul miglioramento del salice presso l'Istituto di Casale Monferrato. **[First results of Willow breeding at Casale Monferrato.]** *Cellulosa e Carta* 11 (9), 1960 (6–8). [It.f.e.g.]

The experiments now in progress on Willows at the Istituto di Pioppicoltura involve nearly 45,000 nursery plants representing 168 different clones, largely *Salix alba* of various provenances. In experimental plots at Valenza Po, some showed a mean diam. of 3 cm. and mean height of 4 m. at the end of the first growing season, thus equalling the best Poplar clones. It is hoped to plant Willows on sites unsuitable for any other species.

1447. Clifford, H. T. **Seed production in a wild *Eucalyptus* hybrid.** *Aust. J. Sci.* 22 (12), 1960 (483). 1 ref. O.R.S.

Mean number of seeds per 10 capsules and % germination for (*a*) wild hybrids between (*b*) *E. elaeophora* and (*c*) *E. goniocalyx* were 31 and 74, vs. 35 and 84 for (*b*), and 20 and 77 for (*c*). Both figures showed greater variation in the hybrid (21 trees sampled) than in the parents (11 trees of each sampled). It was concluded that (*a*) is highly fertile and that (*b*) and (*c*) are closely related.

1448. Messeri, A., and Ruggeri, C. Numero cromosomico di *Eucalyptus* × *trabutti* [*sic*] Vilmorin (Myrtaceae). **[The chromosome number of *E.* x *trabutii*.]** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (260–1). [It.] O.B.D.

E. × *trabutii*, a natural hybrid of *E. rostrata* × *E. botryoides*, apparently originating in Morocco, was found to have a chromosome number of $2n = 22$, the same as that of its parents.

1449. Hair, J. B., and Beuzenberg, E. J. **Contributions to a chromosome atlas of the New Zealand flora—2–4.** *N.Z. J. Sci.* 2 (1; 4), 1959 (148–56; 531–8); 3 (3), 1960 (432–40).

(2) Includes species of *Corokia* and *Griselinia*, *Hedycarya arborea*, *Laurelia novae-zealandiae*, *Myoporum laetum*, *Persoonia toru*, *Knightia excelsa*, *Discaria toumatou*, *Dodonaea viscosa*, and *Entelea arborescens*.

(3) Species of *Fuchsia*, *Melicytus* and *Hymenanthera* are among those dealt with.

(4) Includes *Corynocarpus laevigatus*, *Ackama rosaefolia*, *Weinmannia sylvicola*, *W. racemosa*, *Carpodetus serratus*, *Rhabdothamnus solandri*, *Beilschmiedia tarairi*, *B. tawa*, *Phebalium nudum*, *Melicope ternata* var. *mantellii* and *M. simplex*.

1450. Frierson, J. R. **Cytotaxonomic study of selected indigenous and introduced species of the genus *Ilex*, commonly grown in the United States.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (2), 1960 (288). O.R.S.

Twenty species were studied, 19 having the chromosome number $2n = 40$, and one $2n = 110$. The evolution of the genus in relation to chromosome numbers is discussed.

1451. Frahm-Leliveld, J. A. **Observations on chromosomes in the genus *Indigofera* L.** *Acta bot. neerland.* 9 (3), 1960 (286–93 + 1 tbl.). 20 refs. O.B.D.

In the West African species of *Indigofera* investigated in this study, $n = 8$ was the common basic number. Although identification of the individual chromosomes met with no success, a distinct difference in dimensions could be detected in some cases, and also definite differences in the total length of the chromosome complements. The endemic African species are, with one exception, diploid. Tetraploidy occurs in Afro-Asiatic, Asiatic, American and pan-tropical species, and hexaploidy has been found in some Himalayan species. *From author's summary.*

1452. Funabiki, K. **Polyploidy in relation to vegetational zonation in the Western United States.** *Repr.* from *Bulletin of the Faculty of Agriculture, Niigata University, Niigata* No. 12, 1960 (176–200). 85 refs. [E.e.]

In a study of the % of woody and herbaceous polyploid species in Oregon, Washington, Wyoming, Colorado and California, marked regional variations were observed, depending on the topography, climate, and evolutionary history of each zone. The flora of the Pacific Coast Range showed the same degree of polyploidy as that found in certain Mediterranean islands and areas of Japan in the same latitude. The vegetation of the Rocky Mts. has a much higher % of polyploid species among dicotyledons and monocotyledons than European vegetation in the same latitude, though the European alpine flora may exhibit similar characteristics. Some correlation was found between life zones and chromosomal features, but insufficient to test the hypotheses advanced by Löve and Tischler. *From author's summary.*

168. Histology

See also Nos. 1417–8, 1501, 2325 *et seq.*

1453. Gifford, E. M., Jr. **Histology of vegetative and strobilate apices in certain gymnosperms.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (133). O.B.D.

In *Pinus ponderosa*, *P. sylvestris*, *P. albicaulis*, *P. contorta*, *Larix decidua* and *Ginkgo biloba*. The vegetative and strobilate apices showed comparable zonation patterns throughout active growth periods. The spatial relations of the zones might vary between the two categories of shoot, but the basic organization was invariably present. Only near the end of active strobilate development did the essentially vegetative zonal pattern become obscured The results of this study indicate that there may be fewer structural differences between vegetative and strobilate apices in gymnosperms than between vegetative and floral apices in angiosperms. A consideration of the phylogenetic origin of each shoot type is of utmost importance in these comparative studies.

1454. Skvorcova, N. T. Anatomičeskoe stroenie provodjaščej sistemy čereškov u list′ev predstavitelej semejstv Hamamelidaceae i Altingiaceae. **[The anatomical structure of the conducting system of the petioles in representatives of the Hamamelidaceae and Altingiaceae.]** *Dokl. Akad. Nauk SSSR* 133 (5), 1960 (1231–4). 20 refs. [Russ.] A.P.B.

Presents cross-sectional drawings of the petioles of 23 species (23 different genera), and discusses particularly the classification of *Altingia* and *Liquidambar* [cf. *F.A.* 21 No. 2801], concluding, *inter alia*, that these two genera should be classed as a separate family, Altingiaceae.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 2002 *et seq.*, 2475 *et seq.*

1455. Booth, C. **Studies of Pyrenomycetes. IV. *Nectria* (Part I).** *Mycol. Pap. Commonw. Mycol. Inst.* No. 73, 1959. pp. 115 + 2 plates. 79 refs.

Presents descriptions and life histories of the British species of *Nectria.*

1456. Booth, C. **Studies of Pyrenomycetes. V. Nomenclature of some *Fusaria* in relation to their nectrioid perithecial states.** *Mycol. Pap. Commonw. Mycol. Inst.* No. 74, 1960. pp. 16. 15 refs.

1457. Dennis, R. W. G., Orton, P. D., and Hora, F. B. **New check list of British agarics and boleti.** *Suppl.* to *Trans. Brit. Mycol. Soc.* Cambridge University Press, London. 1960. pp. 225. Price 15*s*.

1458. Weresub, L. K., and Gibson, S. **"*Stereum pini*" in North America.** *Repr.* from *Canad. J. Bot.* 38, 1960 (833–67). 43 refs.

A study of the taxonomic and morphological relationship of American "*Stereum pini*", European "*Stereum pini*", and American *Peniophora duplex*. It is concluded that the three taxa are best treated, at present, as *Peniophora pini* aggregate.

1459. Jacquiot, C. Contribution à l'étude de quelques espèces affines de la série des igniaires. I. *Phellinus robustus* Karst., *P. hartigii* Allesch. et Schn., *P. fulvus* (Scop.) Pat. **[Study of some species related to the "*igniarius*" series. I. *P. robustus*, *P. hartigii* and *P. fulvus*.]** *Bulletin Trimestriel de la Société Mycologique de France, Paris* 76 (1), 1960 (83–106 + 1 plate). 25 refs. [F.] O.B.D.

1460. Parmelee, J. A. **The fungi of Ontario. I. Uredinales.** *Publ. Dep. Agric. Can.* No. 1080, 1960. pp. 46. 29 refs.

Describes 233 species. There is an index of host genera.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 1499, 2325.

1461. Vedel, H., and Lange, J. **Trees and bushes in wood and hedgerow.** Methuen & Co. Ltd., London. 1960. pp. 224. Price 16*s*.

The book, translated by C. H. R. Hillman from the Danish original and adapted by H. L. Edlin to British conditions, is similar in text and general lay-out to "*Træer og busker i farger*" [see *F.A.* 21 No. 4093]. The plates are identical.

1462. Sokolov, S. Ja. [Editor]. Derev′ja i kustarniki SSSR, dikorastuščie, kul′tiviruemye i perspektivnye dlja introdukcii. **[Trees and shrubs of the U.S.S.R.—native, cultivated or promising for introduction.]** Akademija Nauk SSSR, Moscow & Leningrad. Vol. V, 1960. pp. 543. 9 pp. of refs. [Russ.]

[Cf. *F.A.* 20 No. 2835.] Covers the dicotyledons from Myrtaceae to Oleaceae.

1463. Fukarek, P. Pregled dendroflore Bosne i Hercegovine. **[A review of the dendroflora of Bosnia and Herzegovina.]** *Nar. Šumar., Sarajevo* 13 (5/6), 1959 (263–86). 3 refs. [Croat.g.]

A systematic list, giving Latin and native names, of 279 native tree and shrub species found in the region, with their varieties and known hybrids. Commonly cultivated exotics are included in the list (marked by asterisks). In accordance with modern usage, various genera are divided (e.g. *Prunus*, *Cornus*, *Rhamnus*, *Genista*), and *Acer marsicum* is elevated to specific status. [Cf. *F.A.* 20 No. 4198.]

1464. Arora, R. K. **The flora of North Kanara (statistics—biological notes).** *Indian For.* 86 (10), 1960 (609–16). 6 refs.

1465. Rosayro, R. A. de. **Field key to the identification of wet evergreen (rain forest) tree species [of Ceylon].** *Ceylon For.* (*n.s.*) 4 (3), 1960 (287–94).

Synthesizes, in tabular form, the information contained in two previous articles [cf. *F.A.* 15 No. 107]. There are 14 photographs of bark types.

1466. Hubbard, C. E., and Milne-Redhead, E. [Editors]. **Flora of tropical East Africa. Rosaceae. (including Amygdalaceae and Chrysobalanaceae).** Crown Agents for Oversea Governments and Administrations, London. 1960. pp. 61. Price 5*s*.

1467. Turrill, W. B., and Milne-Redhead, M. A. [Editors]. **Flora of tropical East Africa. Canellaceae.** Crown Agents for Oversea Governments and Administrations, London. 1956. pp. 4. Price 1*s*.

Warburgia stuhlmannii, *W. ugandensis*, and *W. elongata.*

1468. Macbride, J. F. **Flora of Peru. [Palmae.]** *Botanical Series, Field Museum of Natural History, Chicago* 13 (Part 1, No. 2), 1960 (321–418).

174.2/.7. Gymnosperms

See also Nos. 1430–1, 2326–7, 2589.

1469. Hadfield, M. **Some notes on the Ginkgo.** *Quart. J. For.* 54 (4), 1960 (331–7). 28 refs.

The early history of *Ginkgo biloba* is described and its botanical features discussed. Its discovery and introduction into Europe, and history in Britain are outlined. Some account is given of the tree in China and Japan. Finally its uses as an ornamental tree and propagation are briefly outlined. *From author's summary.*

1470. Krüssmann, G. Die Nadelgehölze. **[Conifers.]** Paul Parey, Berlin and Hamburg. 2nd ed. (rev.) 1960. pp. 8 + 335. 119 refs. [G.] Price *DM.*46.

Subtitled "A systematic survey and alphabetical catalogue, with descriptions and appraisal of species winter-hardy in Central Europe and of some other genera and forms." It constitutes a companion volume to the author's manual on broadleaved woody species [cf. *F.A.* 14 No. 3097] and lists ca. 1483 species, varieties, or forms, mainly for the use of nurserymen and gardeners.

1471. Schmithüsen, J. Die Nadelhölzer der Waldgesellschaften der südlichen Anden. **[The conifers of the forest communities of the southern Andes.]** *Vegetatio* 9 (4/5), 1960 (313–27). [G.] A.P.B.

[Cf. *F.A.* 18 No. 1428.] Deals with (1) the Chilean conifers and their geographical distribution throughout the world, (2) the distribution of the conifers of the Chilean forests and their classification into vegetational regions and altitudinal zones, and (3) the place of conifers in the forest communities of the S. Andes and their site relationships.

1472. Boivin, B. *Abies balsamea* (Linné) Miller et ses variations. **[*A. balsamea* and its varieties.]** *Naturaliste Canadien, Québec* 86 (10), 1959 (219–23). 1 ref. [F.] L.S.

On the basis of an examination of needles and cones of *A. balsamea* and *A. lasiocarpa*, it is proposed to merge the two species and to adopt the following classification: *A. balsamea* subsp. *balsamea*, with varieties *balsamea* (including a dwarf form *hudsonia*) and *phanerolepis* (with a dwarf form *aurayana*), and *A. balsamea* subsp. *lasiocarpa* with varieties *lasiocarpa* (including a dwarf form *compacta*) and *arizonica*.

1473. Taylor, T. M. C. **The taxonomic relationship between *Picea glauca* (Moench) Voss and *P. engelmannii* Parry.** *Madroño, S. Francisco* 15 (4), 1959 (111–5). 7 refs. E.B.

In the author's opinion, the phylogenetic relationship between *P. glauca* and *P. engelmannii* is best indicated by regarding them as subspecies of a single species, for which he proposes the names *P. glauca* subsp. *glauca* and *P. glauca* subsp. *engelmannii* stat. nov.

1474. Fukarek, P. Prilog poznavanju crnog bora (*Pinus nigra* Arn.s.lat.). **[Notes on *P. nigra* s.l.]** *Rad. Poljoprivred.-Šum. Fak., Sarajevo* (*Šum.*) *3B* (3), 1958 (3–92). 452 refs. [Croat.g.]

A detailed study of the botany, nomenclature and natural distribution (particularly in the Balkan Peninsula and Bosnia and Herzegovina), of *P. nigra* s.l., which is taken to include *P. clusiana*, *P. laricio*, *P. nigricans*, *P. pallasiana* and their subspecies.

1475. Newcomb, G. B. **The relationships of the Pines of Insular Baja California.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (281). O.B.D.

The most recent taxonomic treatment has placed the Cedros Island Pine in *Pinus muricata* var. *cedrosensis* and the Guadalupe Island Pine in *P. radiata* var. *binata*. A thorough study of the foliar anatomy and cones of the two Pines, however, suggests that the two populations are more closely related than is indicated by their present nomenclatorial status. Variation within the Guadalupe Island Pine is probably due to introgression by *P. radiata* into a Cedros Island stock, while introgression of this same stock with *P. muricata* on the Channel Islands of "Alta" California has produced *P. remorata*. Confirmation of these suggestions must await a long-range breeding programme.

1476. Haller, J. R. **The role of hybridization in the origin and evolution of *Pinus washoensis*.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (149). O.B.D.

Pinus washoensis occurs as a distinct entity only in a few restricted high morainal slopes on Mt. Rose in western Nevada. Here it occurs sympatrically with *P. jeffreyi*, but the two species do not appear to hybridize at present. There is evidence, however, that *P. washoensis* may have arisen through introgression of *P. jeffreyi* into *P. ponderosa*, possible as recently as the Pleistocene epoch. *P. washoensis* has apparently failed to establish any effective isolating mechanisms between itself and *P. ponderosa*, and on the non-morainal slopes at relatively low altitudes, where the two species are sympatric, *P. washoensis* is being swamped by hybridization. However, this hybridization is also affecting *P. ponderosa* in the area, and may eventually produce a new geographic race, distinct from the original *P. ponderosa* and better adapted, owing to the influence of *P. washoensis*, for survival in the severe environment in which the hybridization is now taking place.

175.2. Monocotyledons

See No. 1418.

176.1. Dicotyledons

See also Nos. 1421–7, 1443, 1447–52, 1454, 1513–4, 2328.

1477. Papp, J. Mátrai ösjuhar—*Acer acuminatilobum* J. Papp. **[A new Maple, *A. acuminatilobum* in the Mátra Mountains.]** *Erdö* 7 (1), 1958 (29–30). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (10–1). [E.] C.G.B.

The new species has leaves like *A. campestre* (but coriaceous and with acuminate lobes); in wood anatomy, however, it differs considerably from that species. It is a 20-m. tree with bark shed in strips. It is protected by the Nature Conservation Commission and its propagation is under study.

1478. KRAL, R. **A revision of *Asimina* and *Deeringothamnus* (Annonaceae).** *Brittonia, N.Y.* 12 (4), 1960 (233–78). 19 refs.

General notes on history, morphology, pollination, reaction to disturbance, cytology and genetics, are followed by keys to and descriptions of 8 species of *Asimina* (including *A. longifolia* nom. nov.) and a new hybrid (*A.* × *nashii* = *A. speciosa* × *A. longifolia*), along with notes on 5 other hybrids, and 2 species of *Deeringothamnus. Pityothamnus* is included in *Asimina.*

1479. TENNANT, J. R. **Notes on African Araliaceae: I. The genus *Cussonia* Thunb. in Africa.** *Kew Bull.* 14 (2), 1960 (220–4). Several refs.

Includes a description of *C. lukwangulensis* sp. nov., from Tanganyika, and critical notes on some other species. Several new varieties and forms are described.

1480. FORMAN, L. L. **Notes on *Galearia* Zoll. & Mor.** *Kew Bull.* 14 (2), 1960 (311–7). Many refs.

Includes new descriptions of *G. maingayi* and *G. celebica* (with one new var.), both placed in the new subgenus *Orthopetalum. G. caudata* nom. nov. is proposed for *G. pedicellata* (R. Br.) Miq. (non Zoll. & Mor.).

1481. LAUGHLIN, K. ***Quercus mutabilis* in the Big Oak Tree State Park of Missouri.** *Phytologia* 6 (7), 1958 (374–8). L.S.

Compares the characters of *Q. palustris, Q. shumardii* and of *Q.* × *mutabilis*, their hybrid.

1482. SHAW, H. K. A. **A new species of *Caryodaphnopsis* (Lauraceae).** *Kew Bull.* 14 (2), 1960 (250–1).

C. laotica, a small tree from Laos. Appends the new combination *Alseodaphne titanophylla* for the species formerly described by the author as *Beilschmiedia titanophylla.*

1483. DAWKINS, H. C. **Field characters of the Uganda forest *Albizia*.** *Tech. Note For. Dep. Uganda* No. 86 (60), 1960. pp. 2.

Deals with *A. adianthifolia, A. coriaria, A. ferruginea, A. glaberrima, A. grandibracteata, A. gummifera, A. isenbergiana, A. schimperiana*, and *A. zygia.*

1484. GILLETT, J. B. **A new species of *Cordyla* from Somaliland.** *Kew Bull.* 14 (2), 1960 (213–5). Several refs.

Notes on, and Latin description of, *C. somalensis*, a small tree or shrub from Ethiopian Ogaden and Somalia. It needs an annual rainfall of only 250 mm., is grazed by all stock, produces a large edible seed, and might prove of economic value for tropical arid regions.

1485. GILLETT, J. B. **The genus *Craibia*.** *Kew Bull.* 14 (2), 1960 (189–97). Many refs.

Contrasts the characters of *Craibia* and *Millettia* and gives a key to and enumeration of the species and subspecies of *Craibia. C. filipes* var. *macrantha* becomes *C. macrantha* (redescribed); *C. bequaertii* is excluded (it is a synonym of *M. psilopetala*). An index of synonyms is provided.

1486. SMITH, C. E., JR. **The species of *Cedrela* (Meliaceae).** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (368). [E.] O.B.D.

An examination of living and herbarium material has led the author to conclude that the genus *Cedrela* has only 7 species, and that there is not yet sufficient evidence that any of the minor variations warrant naming as varieties. Major changes include the merging of *C. mexicana* into *C. odorata*, the restriction of *C. fissilis* to the pubescent-leaved *Cedrela* of southern America, and the application of the name *C. angustifolia* to the puberulent Central and South American species which had formerly been lumped in *C. fissilis* or split into numerous species on minor variations. Much of the confusion in the genus is due to the weedy nature of Spanish Cedar (it is usually present in second growth), and to its apparent close species relationship, which allows interbreeding wherever two species grow in close proximity.

1487. GARDNER, C. A. **Trees of Western Australia. No. 71—Coarse-leaved Mallee; No. 72—Desmond Mallee; No. 73—*Eucalyptus falcata*; No. 74—Jerdacattup Mallee; No. 75—Redheart; No. 76—*E. corrugata*; No. 77—Goldfields Blackbutt; No. 78—Strickland's Gum.** *Repr.* from *Journal of Agriculture of Western Australia, Perth* (*Ser. 4*) 1 (7), 1960 (1–12). (*Bull. Dep. Agric. W. Aust.* No. 2780.)

Brief notes, with drawings, on *E. grossa, E. desmondensis, E. falcata, E. goniantha, E. decipiens, E. corrugata, E. le-souefii*, and *E. stricklandii.*

1488. HU, S.-Y. **The taxonomy, geography and economic importance of the genus *Fraxinus* in China.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (172). [E.] O.B.D.

Forty-six species of *Fraxinus* have been recorded from China, but many of these recordings are inaccurate and a revision of the genus is due. The author describes a new subgenus from the tropical and subtropical regions of China; this includes 5 species with naked winter buds, entire leaflets, bracteate branches of the panicles, and very short filaments (¼ the length of the anther), and is considered to be primitive among the subdivisions of the genus. A species of this primitive group extends its range southward to Sumatra. Two species from central and western China show close affinities with N. American species. One other species from N. China and one from Yunnan show close affinity with a European species. *F. chinensis* is extensively cultivated in China for its valuable wood, for its pliable twigs used in wickerwork, and as a host for certain species of scale insect which secrete candle wax.

1489. FUKAREK, P. Différences morphologiques et anatomiques entre le frêne commun (*Fraxinus excelsior* L.) et le frêne oxyphylle (*F. angustifolia* Vahl.). **[Morphological and anatomical differences**

between *F. excelsior* and *F. angustifolia*.] *Bull. Soc. Bot. France* 107 (4/6), 1960 (192–9). 22 refs. [F.] O.B.D.

A review based on world literature, and including tables of comparisons of (1) morphological characters and distribution of the trees, and (2) physical and mechanical properties of the woods.

1490. Chen, C. L. **Morphological basis of the systematics of *Manilkara* (Sapotaceae).** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (68). O.B.D.

A review of the floral morphology of *Manilkara* suggests that the following are congeneric with it: *Achras*, *Northiopsis*, *Fancherea* and *Shaferodendron*. The combination of *Muriea* is also favoured.

1491. Heine, H., and Hemsley, J. H. **Notes on the African Sapotaceae: II. The genus *Bequaertiodendron* De Wild.** *Kew Bull.* 14 (2), 1960 (304–9). Many refs.

Gives an emended Latin description of the genus, including the following species (all new combinations): *B. magalismontanum*, *B. natalense*, and *B. oblanceolatum*. These have been variously placed, at different times under the genera *Chrysophyllum*, *Boivinella*, *Pachystela*, *Pouteria*, *Tisserantiodoxa*, *Zeyherella*, etc. Many synonyms are quoted.

1492. Broekhuizen, J. T. M. **Some notes on the identification and nomenclature of Poplars.** *Commun. Inst. For. Res. Agric. Univ. Wageningen* No. 1, 1960. pp. 9. 8 refs. [E.]

A comparison of 1- to 3-year plants of *Populus* "Serotina de Champagne" (registered in 1950) and *P.* × *canadensis* "Keppels glorie" (registered in 1958) suggests that the two cultivars are identical. The former name has priority, but as it suggests a close relationship with *P.* × *serotina*, a change to *P.* × *canadensis* "Champagne" is suggested. Other changes in cultivar names recommended are: from *P.* × *canadensis* "Serotina erecta" (♀) to *P.* × *canadensis* "Regenerata": from *P.* "Serotina de Selys" or "Selys" to *P.* "Serotina erecta": from *P.* "Regenerata Deutschland" to *P.* "Harff": and from *P.* × *canadensis* "Serotina de Poitou" to *P.* × *canadensis* "Poitou".

1493. Müller, R. Altstammsorten der Schwarzpappelbastarde (IIt). Die 'Robusta'-Pappel. **["Old stock varieties" of Black Poplar hybrids (IIt). The 'Robusta' Poplar.]** *Holz-Zbl.* 81 (118), 1960 (1658 . . . 1663). 51 refs. [G.g.]

Discusses the history, distribution, and general merits of this variety. *P.* "bachelieri" and *P.* "vernirubens" (the author doubts whether the latter is the same as *P. vernirubens* Henry) and some others are considered to be identical, but among the stock grown under the name 'Robusta' were a "Forndorf" and mixtures. Differences from "Missouriensis Holland (Heidemij)" and "Lampertsheim" are described. In spite of its rapid early growth and a good habit, which led to its wide distribution, it is now considered a failure because of its susceptibility to wind and frost damage, rust, ***Dothichiza populea*** and '***Braunfleckengrind***' disease.

1494. Børset, O., and Haugberg, M. Ospa. **[*Populus tremula*.]** Det Norske Skogselskap, Oslo. 1960. pp. 176. 6 pp. of refs. [Nor.] Price *Kr.*11.

A comprehensive handbook covering: its position in Norwegian forestry; botanical description; ecology; diseases and injuries; natural and artificial regeneration; tending; increment; properties and uses of the wood; felling and transport; marketing and grading; economic aspects; and breeding.

1495. Melville, R. **The names of the Cornish and the Jersey Elm.** *Kew Bull.* 14 (2), 1960 (216–8). Several refs.

The correct name of the Cornish Elm is *Ulmus angustifolia* Weston var. *cornubiensis* (Weston) Melville, comb. nov., *U. angustifolia* being typified by the Goodyer Elm (*U. angustifolia* var. *angustifolia*). The Jersey Elm appears to be a hybrid of complex origin and is named *U.* × *sarniensis* stat. nov.

1496. Moldenke, H. N. **Materials towards a monograph of the genus *Citharexylum* I–VII.** *Phytologia* 6 (4–8), 1958/1959 (242–56; 261–320; 332–68; 383–432; 448–505); 7 (1; 2), 1959 (7–48; 49–73). Many refs. L.S.

1497. Moldenke, H. N. **Additional notes on the genus *Citharexylum*. I.** *Phytologia* 7 (2), 1959 (73–7). L.S.

1498. Moldenke, H. N. **Materials toward a monograph of the genus *Pseudocarpidium*. I.** *Phytologia* 7 (2), 1959 (91–104). L.S.

18. Plant Ecology

See also No. 2646.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 1396, 1471, 1494, 1684, 1686.

1499. Taylor, C. J. **Synecology and silviculture in Ghana.** Thomas Nelson & Sons, Ltd., Edinburgh and London. 1960. pp. xi + 418 + 120 plates + 2 maps. 50 refs. Price £5. 0. 0.

Part I covers history, topography, climate, soil and life forms; Part II, the vegetation by vegetation types (rain forest, moist semi-deciduous forest, seral communities in the high forest zone, savanna-woodland, coastal scrub and grassland, and maritime vegetation), supported by lists of trees by girth classes from 6 reserves, and a map. Part III, Silviculture, the main section, includes the description of 160 tree species arranged alphabetically by families, genera and species, with special reference to the identification, autecology and artificial regeneration of seedlings, supported by many photographs and drawings, and tables on phenology, germination dates and seed weights.

1500. Weck, J. **Conifers in the tropics.** International Society of Tropical Foresters, Washington. [*n.d.*] pp. 10 + 2. Transl. from *Forstwiss. Cbl.* 77 (7/8), 1958 (203–30). [See *F.A.* 20 No. 1506.] Limited distribution.

1501. Arena, M. Caratteristiche ecologiche degli organi vegetativi giovanili di *Abies nebrodensis* (Lojac.) Mattei, desunte dalla loro struttura. **[The ecological characters of the juvenile vegetative organs of *A. nebrodensis* deduced from their structure.]** *Atti della Accademia Nazionale dei Lincei, Roma* (*Ser. 8*) 26 (2), 1959 (252–8 + 28 photos). [It.] L.S.

A detailed study of the structure and histology of twigs, needles, and buds of the only existing mature specimen of this Fir, from which the author deduces the probable reason for its survival in this relict form.

1502. Lee, S. C. **The Taiwan Red and Yellow Cypress and their conservation.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (221). O.B.D.

A study of the ecology and silviculture of *Chamaecyparis formosensis* and *C. taiwanensis* [?] led to the following conclusions. (1) They are endemic to Taiwan because of its special climate, combining high relative humidity, cool temperature, moderately high rainfall and the influence of prevailing typhoons. (2) They are approaching extinction through lack of natural regeneration· Since they are light-demanders, germination and growth of seedlings are impeded by a thick and luxurious ground flora. Over-exploitation has occurred in accessible areas, and in inaccessible areas an excessive proportion of overmature and non-seedbearing trees remain. (3) The overmature stands should be felled within 100 years, not the 40 years of the present management plan, and the age classes of normal forest should be regulated in accordance with a 120-year rotation. (4) Large-scale artificial regeneration should be undertaken.

1503. *Cupressus lusitanica* Miller et *C. macrocarpa* Hartweg: caractères sylvicoles et méthodes de plantation. **[*C. lusitanica* and *C. macrocarpa*: their silvicultural characters and plantation technique.]** *Bois For. Trop.* No. 73, 1960 (25–30). 16 refs. [F.]

1504. Brown, J. M. B. **The Corsican Pine in its native land. Part I.** *Emp. For. J.* 39 (3), 1960 (294–318).

In the three large State forests in Corsica where these studies were made, the Corsican Pine, largely pure, extends from 900 to 1500–1600 m.; at the lower limit it competes with *Pinus pinaster*, at the upper with *Fagus sylvatica*, or sometimes *Abies alba* or *Betula verrucosa*. Some account is given of the manner in which the distribution of these five species, while basically linked with altitude, is modified by aspect and other local features. In the Forêt de Valdo-niello, continuous records of rainfall and air temperature over a 4-year period permitted a comparison between certain climatic features of the Corsican Pine forest and those of lowland and upland sites in Britain, where the planting of this exotic has been attended by variable results. The soil conditions in the optimum zone are also described. Granites are usually the parent rock in the main mountain chain where the Corsican Pine forests are found: deep, well drained, rather fertile soils prevail in the valleys, but on steep, rocky, eroded hill slopes, conditions are much less favourable. At the upper altitudes protection against fire and soil erosion is the main consideration in forest management. *From author's summary.*

1505. Horton, K. W., and Brown, W. G. E. **Ecology of White and Red Pine in the Great Lakes—St. Lawrence Forest Region.** *Tech. Note For. Br. Can.* No. 88, 1960. pp. 22. 35 refs.

Presents observations on the specific site preferences and broad ecological relationships of *Pinus strobus* and *P. resinosa*, which are shown to be trees of relatively dry climatic and soil conditions. Their resulting distribution in different sections of the region is described; and local occurrence as a result of natural succession, fire, felling etc. is considered. *From authors' summary.*

1506. Horton, K. W., and Bedell, G. H. D. **White and Red Pine ecology, silviculture and management.** *Bull. For. Br. Can.* No. 124, 1960. pp. 185. 430 refs. Price $1.00.

A monograph on *Pinus strobus* and *P. resinosa*, as single species, and growing together as a forest type, with special reference to conditions in the Great Lakes/St. Lawrence forest region. The object was to gather together all available information from both published and unpublished sources.

1507. Barrau, J. **The Sandalwood tree.** *South Pacific Bulletin, Sydney* 10 (4), 1960 (39, 63–4). L.C.O.

Consists of botanical notes, listing the main species in Oceania, notes on the uses of the essential oil, and a brief survey of past exploitation and some present regulations controlling felling or ensuring replanting.

181.1. Distribution, Natural Range

See also Nos. 1452, 2589.

1508. Holzapfl, R. Die natürliche und künstliche Verbreitung der Weisstanne im mittelfränkischen Keupergebiet. **[The natural and artificial distribution of *Abies alba* in the keuper region of Central Franconia.]** *Forstwiss. Cbl.* 79 (9/10), 1960 (298–332). Many refs. [G.g.]

A detailed survey, using pollen analysis, place-name derivations, archives, etc. It is concluded that the extension of the Fir's natural range had not yet ended when man's activity began to affect it. The natural limits of the range could not be determined on the basis of climatic factors. Experimental introduction of Fir began in the second half of the 18th century. Its ability to compete on various sites is discussed, and some peculiarities of wood structure etc. are pointed out.

1509. Baldwin, H. I. **Distribution and ecology of *Pinus banksiana* in New Hampshire.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (17). O.B.D.

P. banksiana occurs in New Hampshire in only 4 widely separated stations, outliers from the southern limit of its range. These are all on bare rock ledges, originally denuded by fire or landslide.

Most of the trees are young and there is evidence that the communities are increasing in density and spreading in area. Habitats and associated species are similar in all stations. Hypotheses for the origin of the trees and the successional history are advanced.

1510. YOUNGBERG, C. T., and DYRNESS, C. T. **The influence of soils and topography on the occurrence of Lodgepole Pine in central Oregon.** *Northw. Sci.* 33 (3), 1959 (111–20). 6 refs. L.S.

Presents some preliminary information on site conditions of Lodgepole Pine in an area in south central Oregon.

1511. HALLER, J. R. **Factors affecting the distribution of Ponderosa and Jeffrey Pine in California.** *Madroño, S. Francisco* 15 (3), 1959 (65–70). 4 refs. E.B.

Pinus ponderosa and *P. jeffreyi* are important components of the California montane forest. *P. ponderosa* generally occurs on the lower coastal slopes, and *P. jeffreyi* on the higher coastal or interior slopes. The distribution of *P. ponderosa* is usually limited by lack of moisture at low altitudes and by low temperatures at high altitudes. *P. jeffreyi* is also limited by low temperature at high altitudes, but at its lower margin the distribution of the species is apparently limited primarily by competition from *P. ponderosa*. The extensive mixed stands in S. California, where *P. ponderosa* may be less vigorous than in the north, might be the result of decreased competition from *P. ponderosa*. *P. jeffreyi* is more tolerant of cold and aridity than *P. ponderosa* and at least as tolerant of high temperature and high moisture. *From author's summary.*

1512. WAGENER, W. W. **A comment on cold susceptibility of Ponderosa and Jeffrey Pines.** *Madroño, S. Francisco* 15 (7), 1960 (217–9). E.B.

Observations over 25 years lead the author to hold that there is no material difference in the cold resistance of the two species, such as to affect their natural distribution [cf. preceding abstract].

1513. WOOD, J. G. **The phytogeography of Australia (in relation to radiation of *Eucalyptus*, *Acacia*, etc.).** *Monographiae Biologicae, The Hague* 8, 1959 (291–302). 31 refs. [E.] L.S.

Traces briefly the history of the sclerophyllous shrub genera, and of the genera *Eucalyptus* and *Acacia*, with particular reference to their distribution during the late Tertiary to recent periods, and discusses the factors influencing their present distribution. Any attempt to reconstruct the radiation of these species is hindered by the fragmentary nature of the Tertiary record, which makes it impossible to determine their centres of origin.

1514. PRYOR, L. D. **Species distribution and association in *Eucalyptus*.** *Monographiae Biologicae, The Hague* 8, 1959 (461–71). 15 refs. [E.] L.S.

Discusses the distribution of *Eucalyptus* spp. in Australia, variations in populations, hybridization, and the nature of *Eucalyptus* associations.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 1403–6, 1436–7, 1442, 1511–2, 1553, 1572–7, 1630, 1640, 1954–6, 2349.

1515. VAARTAJA, O. **Effect of photoperiod on drought resistance of White Spruce seedlings.** *Repr.* from *Canad. J. Bot.* 38 (4), 1960 (597–9). 5 refs.

Seedlings of *Picea glauca* were grown for 2 months under 3 photoperiodic treatments. Short-day treatment induced early terminal dormancy and resistance to severe drought conditions, whereas long-day treatments allowed prolonged growth of most seedlings and made them susceptible to drought. *From author's summary.*

1516. VAARTAJA, O. **Photoperiodic response in seedlings of five species of *Betula* and *Pinus*.** *Repr.* from *Canad. J. Bot.* 38, 1960 (807–13). 6 refs.

The existence of photoperiodic response was experimentally established in *Betula lenta*, *B. mandshurica* var. *japonica*, *B. glandulosa*, *Pinus lambertiana* and *P. monticola*. The responses of seedlings from different latitudes and altitudes were in accordance with the theory of photoperiodic ecotypes. [Cf. *F.A.* 21 No. 268.]

1517. PARKER, J.; SAKAI, A. **Survival of woody plants at extremely low temperatures.** *Nature, Lond.* 187 (4743), 1960 (1133–4). 14 refs.

Parker gives some data on resistance to very low temperatures from his own studies, which confirm Sakai's findings [cf. *F.A.* 21 Nos. 2836–7], but criticizes some of the latter's assumptions. Attention is drawn to the time-lag effect in dying of cold-treated leaves, which may lead to serious error in such experiments. Sakai replies.

1518. WILNER, J., KALBFLEISCH, W., and MASON, W. J. **Note on two electrolytic methods for determining frost hardiness of fruit trees.** *Canad. J. Pl. Sci.* 40 (3), 1960 (563–5 + 1 plate). 5 refs. O.R.E.

Describes the techniques [cf. *F.A.* 21 No. 3261]. Preliminary tests indicated consistency and reliability, and tests will be extended to other over-wintering plants.

1519. WILNER, J. **Relative and absolute electrolytic conductance tests for frost hardiness of Apple varieties.** *Canad. J. Pl. Sci.* 40 (4), 1960 (630–7 + 4 plates). 10 refs. O.R.E.

[Cf. preceding abstract.] Diffused electrolytes from pre-hardened twigs provided a reliable means of testing their hardiness; a definite connexion emerged between increased diffusion of electrolytes from hardened tissues and increased injury of twigs.

181.3. Water, Soil and Root Relations

See also Nos. 1353, 1510–1, 1515, 1573, 1578–9, 1630, 1635, 1690, 1753, 1847, 1959.

1520. MARCET, E. Modellversuch zur Frage der spezifischen Eignung bestimmter Pappelsorten für nicht optimale Böden. **[Pilot trials to investigate the specific adaptability of Poplar varieties to inferior soils.]** *Silvae Genet.* 9 (4), 1960 (93–101). 8 refs. [G.g.e.f.]

The growth of 8 different Poplar varieties was observed over a period of 2 years on 4 different sites: (1) offering what are generally considered optimum conditions for Poplars; (2) considered adequate, i.e. drained, low-lying marshland; and (3) and (4) considered unsuitable, i.e. with sandy and loamy soils. The dry weights of aerial and subterranean parts of the plants and their ratios were estimated. Favourable site conditions appear to be a decisive factor for growth, and all varieties behaved more uniformly on (1) than on (2), (3) and (4), where some varieties did considerably better than others.

1521. Dyrness, C. T. **Soil-vegetation relationships within the Ponderosa Pine type in the central Oregon pumice region.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (402). O.R.S.

The study area lies at elevations of 5000–6300 ft., is mantled with pumice deposits 1–4½ ft. deep, and has precipitation totals of 20–25 in. Six plant communities were identified in the *Pinus ponderosa* and *Abies concolor* zones; they were, in order of increasing effective moisture content: (1) *P. ponderosa/Purshia tridentata*; (2) *P. ponderosa/Purshia tridentata/Festuca idahoensis*; (3) *P. ponderosa/Purshia tridentata/Arctostaphylos parryana* var. *pinetorum*; (4) *P. ponderosa/Ceanothus velutinus/Purshia tridentata*; (5) *P. ponderosa/C. velutinus* and (6) *A. concolor/C. velutinus*. All except (4) (interpreted as representing an earlier successional stage in the (6) habitat) are considered to be edaphic climaxes. (2) is restricted to areas of Shanahan loamy coarse sand, the other five all occur on soils of the Lapine series. Morphological characteristics of the Lapine series (e.g. thickness of the AC and C_1 horizons and degree of mixing of the C_2 pumice with buried soil material) were related to plant-root distribution and there were apparent correlations with plant communities, though these were obscured by variations in pumice depth. Depth and time of onset of soil drought proved to be important factors in the distribution of plant communities, except in (1), where the Lapine C horizons, owing to the scarcity of plant roots in these layers, retained appreciable quantities of available soil moisture throughout the growing season. Amounts of soil moisture in the A_1 and AC horizons were often depleted to the permanent wilting % 1–3 weeks earlier in the open than under shrub cover. The more mesic plant communities appeared to be associated with higher levels of some nutrients in the A_1 horizon; e.g. the A_1 horizon under (5) and (6) contained rather higher amounts of available P, exchangeable Ca and total N. The fertility of the Lapine surface soil appeared to be strongly influenced by litter source. Amounts of K, Ca, Mg and N contained in the A_1 horizon proved to be much greater under *C. velutinus* and *A. parryana* var. *pinetorum* litter than where the litter consisted mainly of Pine needles. C/N ratios of Lapine and Shanahan A_1 and AC horizons showed no consistent correlation with plant groupings. Pine seedlings growing in the greenhouse on Lapine C_1 and C_2 horizon material showed a significant response to applications of N, P and S.

1522. Smith, L. F. **Early growth of Slash Pine on upland and wet sites.** *J. For.* 58 (9), 1960 (724–5). 1 ref.

Gives details of soils, water tables, rainfall, height growth per month and year, and total tree height, for *Pinus elliottii* in small plantations (aged 3–6 years when the study began) on 2 upland and 2 wet sites in Mississippi. According to the soil-site classification developed for Florida [cf. *F.A.* 17 No. 1850], the wet sites had site indices at age 25 of 25 and 30 ft., and the upland sites 65 and 70 ft.

181.31. Water Relations

See Nos. 1328, 1368, 1397, 1404, 1407, 2181 2357–8.

181.32/34. Soil and Nutrient Relations

See also Nos. 1333–8, 1340–2, 1354–5, 1357–8, 1395, 1739–42, 1786–7, 1962–5.

1523. Ingestad, T. **Studies on the nutrition of forest tree seedlings. III. Mineral nutrition of Pine.** *Physiol. Plant., Copenhagen* 13 (3), 1960 (513–33). 55 refs. [E.e.]

In this study on *Pinus sylvestris*, similar to those on Birch and Spruce [cf. *F.A.* 21 No. 1541], growing time was 95 days at 20° C. and pH 4–5. The control solution, found to be near optimum, contained 50 N, 20 P, 50 K, 40 Ca, 15 Mg, 20 S, 0·93 Fe p.p.m., and trace elements. The absolute requirements (measured by % content in needles at maximum growth) were greatest for N and least for Ca; tolerance of deviation from the optimum was least for Mg, followed by N, and greatest for Ca. Requirements in respect of various elements were less than those of Birch but greater than those of Spruce. In nutrient solutions with the same concentrations of the various elements, Pine had generally higher contents in the needles and higher relative growth (% of maximum) than Spruce. Percent contents corresponding to deficiency and to maximum growth are tabulated and compared with other figures from the literature. Dry weights of stems and needles were strongly correlated. Root development was affected by the nutrient factor, but not as strongly as in Spruce.

1524. Sucoff, E. I. **Distribution and redistribution of potassium, magnesium and calcium in Loblolly Pine (*Pinus taeda* L.) seedlings.** *Abstr.* in *Plant Physiol.* 35 (*Suppl.*), 1960 (xxii). O.R.E.

Loblolly seedlings, grown from seed in automatically irrigated sand cultures, were supplied with amounts of K, Mg, and Ca ranging from deficiency to surplus. After 7 months, when the seedlings were 5 to 80 cm. tall, some of the plants were harvested. External supplies of Ca and Mg were then withheld from the remaining plants, which were allowed to grow for another 2–3 months before harvesting. Chemical analyses of the seedlings showed that K concentrations were highest in needles from the uppermost portion of the stem. The concentrations decreased as the needles matured. In that part of the study where the supply of K in the nutrient solution was too low to support maximum plant growth, the concentrations of K found in the mature needles at all locations on the stem were uniform. In this study Mg concentrations were generally uniform throughout the plant. However, when K was deficient, the highest concentration of Mg was found in the lower, and when Ca was deficient, in the upper needles. The sudden withholding of Mg from the nutrient solutions induced redistribution; Mg moved from the older needles to support new growth. Ca concentrations were highest in the lower needles, except when lack of Ca limited growth, when concentrations throughout the plant were the same. It was not possible to detect any movement of Ca from old to new needles in response to sudden withholding of it from the nutrient solution.

1525. Armson, K. A. **White Spruce seedlings: the growth and seasonal absorption of nitrogen, phosphorus, and potassium.** *For. Bull. Univ. Toronto* No. 6, 1960. pp. 37. 27 refs.

The growth and changes in N, P, and K contents of White Spruce [*Picea glauca*] seedlings were studied during their first 2 growing seasons at an Ontario nursery. During the 1958 season, 120 seedlings were sampled at weekly intervals in the period May–Dec. In 1959, 80 were taken at 3- to 4-weekly intervals during April–November. In both years, seedlings were only half-grown by late August or early September. There was no suggestion of any periodicity in root development during either growing season. As a result of the study of nutrient content, it is suggested that a clearer picture of the pattern of seasonal absorption of N, P, and K emerges if the size, relative growth rate, and time interval between samples are taken into account. The seedlings in this study showed no evidence of a seasonal periodicity of absorption for N and K, but for P there were, in both years, two periods of high uptake rates, one in the early part of the season (May–June) and a second in late August and September. *From author's summary.*

1526. Seth, S. K., and Bhatnagar, H. P. **Interrelations between mineral constituents of foliage, soil properties, site quality and regeneration status in some *Shorea robusta* forests.** *Indian For.* 86 (10), 1960 (590–601). 4 refs.

It having already been shown [see *F.A.* 19 No. 2138] that the mineral contents of foliage of Sal (*S. robusta*) are related to quality class, results of further analyses seeking a relation between mineral constituents of foliage and of soil, are presented and discussed. (1) The concentration of N, P, K, and Mg in the foliage rises progressively from quality I to IV, i.e. it is inversely related to quality. Ca shows the same trend, but the highest value occurs in quality III. (2) N content of leaves is inversely related to that of the soil; the same is true for K except that its soil/leaf ratio increases slightly in quality IV. Ca contents of soil and leaf show the same trend—rising up to quality III and then falling. Mg and P show no regular trend. (3) Soils deficient in natural regeneration are usually richer in organic matter than those supporting good regeneration. In all soils, irrespective of the status of regeneration, N content decreases from quality I to quality IV; exchangeable Ca is inversely related to regeneration status and to quality I to III; exchangeable K is higher in good and lower in poor regeneration areas, and gradually decreases with fall in site quality from I to III. It is concluded that higher amounts of organic matter in the soil are to some extent toxic or inhibitive to Sal, and may also depress the content of available moisture. The relations between the content of minerals in the soil and in the foliage lead to no practical conclusions—only for Ca has a direct relation been established. Foliar analysis does, however, indicate a regular and direct relation, usually linear, between the leaf concentration of some minerals and the quality of Sal. These relations and the range of values could be used to determine Sal site quality.

1527. Mahonina, G. I., *et al.* Opyt èksperimental'nogo issledovanija raspredelenija radioizotopov v estestvennyh biogeocenozah. **[Experiments on the distribution of radioactive isotopes in natural biogeocoenoses.]** *Dokl. Akad. Nauk SSSR* 133 (2), 1960 (484–7). 10 refs. [Russ.] A.P.B.

Fe^{59}, Co^{60}, Zn^{65}, and Ce^{144} were used to study the migration and re-distribution of chemical elements in (*a*) a stand of young Pine ≯70 cm. tall, with herbaceous plants, and (*b*) Aspen of coppice or sucker origin, ≯60 cm. tall, with herbaceous plants and moss. Both stands were on brown forest sandy loam. Solutions of the chemicals were applied to the soil by watering; their distribution in the aerial parts and roots of the plants, in litter and surface humus, and at various depths in the soil was measured after two years for Co, and after four months for Fe, Zn and Ce. Results are tabulated. The ratio of the radioactivity in 1 g. (dry weight) of the aerial part of the plant to that in 1 g. of the root is tabulated for 20 species of the ground layer, and for Aspen, Pine and Birch (foliage, branches, stems) separately for the four elements.

1528. McMillan, C. **Survival of transplanted *Cupressus* in the pygmy forests of Mendocino County, California.** *Madroño, S. Francisco* 15 (1), 1959 (1–4). 2 refs. E.B.

Seedlings of various strains of *Cupressus* were transplanted from the greenhouse at Berkeley to the pygmy forest [cf. *F.A.* 18 No. 190] in Nov. 1950, and at the same time seedlings were grown at Berkeley in bins of soil from the pygmy forests. In both cases, two strains of *C. pygmaea* did much better than *C. goveniana* or *C. abramsiana*, and it is concluded that this is due to their unique tolerance of the highly acid soils of the pygmy forest area.

1529. Generalova, L. G. Vlijanie stepeni soloncevatosti počvy na rost drevesnyh porod po dannym vegetacionnogo opyta. **[Effect of the degree of soil alkalinity on the growth of woody species. Pot experiments.]** *Počvoved.* 1960 (8), (91–5). 4 refs. [Russ.russ.e.] A.P.B.

In pot experiments, soil from the columnar horizon of a heavy clay-loam solonets (1) was mixed (100, 75, 50, 25 and 0% mixtures by weight) with a humus-rich topsoil from a dark-chestnut heavy clay-loam (2). Determinations were made of adsorbed bases in, and the composition of water extracts of, the various soil mixtures, and the trees grown in them were measured and weighed. Resistance to alkalinity decreased in the order: *Robinia pseudoacacia*, *Quercus robur*, *Gleditsia triacanthos*, and *Larix sibirica*. Admixture of (2) reduced the content of exchangeable Na and improved the growth of the tree seedlings, but the effect became significant only with admixtures of (2) ⩾50%.

1530. Mikola, P. **Liberation of nitrogen from Alder leaf litter.** *Acta for. fenn.* 67 (1), 1958 (1959). pp. 10. 13 refs. [E.fi.]

Detailed results of experiments summarized in an earlier article [cf. *F.A.* 21 No. 242].

181.35: Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 1723, 1743–5, 1788.

1531. Stevenson, G. **Fixation of nitrogen by non-nodulated seed plants.** *Ann. Bot., Lond.* 23 (92), 1959 (622–35). 51 refs. O.R.E.

A fuller version of work already noticed [see *F.A.* 21 No. 248].

1532. Gordienko, I. I. Biogeocenotičeskie svjazi meždu kluben′kovymi bakterijami i bobovymi rastenijami (dneprovskim rakitnikom i beloj akaciej) na Olešskih peskah. **[Biogeocoenotic relationships between nodule-forming bacteria and leguminous plants (*Cytisus borysthenicus* and *Robinia pseudoacacia*) on the Olesh sands.]** *Počvoved.* 1960 (8), (71–4). 4 refs. [Russ.e.] A.P.B.

The author concludes from his studies that the rate of nodulation on roots of *C. borysthenicus* and *R. pseudoacacia* does not depend on the physiological condition of the plants but is directly related to the abundance of nodule-forming bacteria in the soil, which in turn depends on the amount of organic matter in the soil. Such organic matter, in the soils concerned, is composed mainly of the excreta of soil invertebrates.

1533. Lobanow, N. W. [Lobanov, N. V.]. Mykotrophie der Holzpflanzen. **[Mycotrophy in woody species.]** VEB Deutscher Verlag der Wissenschaften, Berlin. 1960. pp. 352. 26 pp. of Russian refs., + 11 pp. of non-Russian refs. [G.] Translation by I. Rawald of *Mikotrofnost′ drevesnyh rastenij* [see *F.A.* 19 No. 2810]. X.

1534. Singer, R., and Morello, J. H. **Ectotrophic forest tree mycorrhizae and forest communities.** *Ecology* 41 (3), 1960 (549–51).

The biological unit of forest-tree/ectotrophic-mycorrhiza/fungus (the ‘ectotroph’) is discussed with particular reference to S. America, where it occurs as dominant or subdominant in climax forests in three regions: (1) the small *Quercus* area in Colombia; (2) the *Alnus jorullensis* region along the Andes, the characteristic ectotroph being *A. jorullensis*/*Gyrodon monticola*, extending from Mexico to Argentina; (3) the *Nothofagus* region, with two typical representatives, *N. dombeyi*/*Russula major* and *N. pumilio*/*R. nothofaginea*. The ecological and climatic conditions that determine the occurrence of ectotrophs are discussed. Ectotrophs are also widely distributed as temporary dominants at some stage of the succession after landslides, fire, felling, etc., have upset the climax vegetation; *Allophylus edulis*/*Gyrodon rompelii* is a typical example. A list of cormophyte and fungus components of ectotrophs is appended.

1535. Dominik, T. **Synopsis of a new classification of the ectotrophic mycorrhizae established on morphological and anatomical characteristics.** *Mycopathologia et Mycologia Applicata, Den Haag* 11 (4), 1959 (358–67). 2 refs. L.S.

[Cf. *F.A.* 18 No. 1372.] Presents a key to and a short description, illustrated by drawings, of the 12 sub-types and their sub-divisions (genera).

1536. Wojciechowska, H. Studia nad mikotrofizmem świerka pospolitego (*Picea excelsa* Lk.) w północnym jego zasięgu, ze szczególnym uwzględnieniem mikotrofizmu zbiorowisk roślinnych Leśnictwie Lipowo Nadleśnictwa Sadłowo pod Biskupcem Reszelskim. **[Studies on the mycotrophy of *P. abies* at the northern limits of its range, particularly in the Lipowo Forest District, Sadłowo region, near Biskupiec Reszelski.]** *Folia for. polon.* (*Leśn.*) No. 2, 1960 (123–66). 70 refs. [Pol.russ.g.]

Studies were made in several forest types during 1954–57. Endotrophic mycorrhizae were classified by Burgeff's method (*Naturwissenschaften* 31, 1943), and ectotrophic mycorrhizae by Dominik's [see preceding abstract]. In all, 16 types were found, the most frequent being Aa, Ab, Fa, Fb, Fc, Ff, Ga and Kb; Fc was the most common, as had been found elsewhere [cf. *F.A.* 17 No. 2550]. On a well developed Spruce, an average of 4 or 5 (but often up to 7) different types of mycorrhiza are found, and on young trees (⩽5 years) an average of 3 types. Stagnant water, as found in Alder stands, was a factor inhibiting mycorrhizal development on Spruce. On peat, Spruce forms coral-like mycorrhizae which occur extensively round the root collar, and the mycotrophic rootlets are more slender than in other forest types. After type Fc, the most frequent types are Fb and Ff, so that the rootlets are generally a golden-brown colour and smooth and shiny.

1537. Dominik, T. Rzut oka na wyniki badań nad mikotrofizmem zespołów roślinnych Tatr. **[Survey of mycotrophy in the plant communities of the High Tatra.]** *Zesz. nauk., Wyższa Szkoła Roln., Szczecin* No. 1, 1958 (63–71 + 3 plates). 8 refs. [Pol.g.]

A review and summary of work, mainly the author's own, classifying the mycorrhizae of the 13 tree communities by the author's classification [see *F.A.* 18 No. 1372].

1538. Boullard, B., and Dominik, T. Recherches comparatives entre le mycotrophisme du *Fagetum carpaticum* de Babia Góra et celui d'autre *Fageta* précédemment étudiés. **[Comparative research on the mycotrophy of the *F. carpaticum* at Babia Góra and of other *Fageta* already studied [in Poland].]** *Zesz. nauk., Wyższa*

Szkoła Roln., Szczecin No. 3, 1960 (3–20 + 10 plates). 7 refs. [F.pol.russ.e.]

The mycorrhizal spectrum at Babia Góra was almost identical with that of Beech in the Baltic region [see *F.A.* 20 No. 2930]. Endotrophic, tolypophagous, and physalido-thamniscophagous mycorrhizae [cf. *F.A.* 20 No. 4271] were very rare at Babia Góra. The mycorrhiza subtype Fc was the most widespread, and was always found among sound and well developed trees. The mycorrhiza Ah is described for the first time.

1539. KONOE, R. Über das Vorkommen der Wurzelpilze bei *Metasequoia* und den nächst verwandten Pflanzen. **[The occurrence of mycorrhizae in *Metasequoia* and nearly related plants.]** *Journal of the Institute of Polytechnics, Osaka City University, Osaka* (*Ser. D*) No. 8, 1957 (179–89). [G.?] From *abstr.* in *Biol. Abstr.* 34 (3), 1959 (No. 6434).

1540. TRIBUNSKAYA, A. YA. [TRIBUNSKAJA, A. JA.]. **A study of the microflora of the rhizosphere of Pine seedlings.** *Transl. For. Prod. Lab. Can.* No. 51411, 1960. pp. 10. Transl. from *Mikrobiologija, Moskva* 24 (2), 1955 (188–92). [See *F.A.* 19 No. 3943.] Limited distribution.

1541. SHEMAKHANOVA [ŠEMAHANOVA], N. M. **The rôle of mycorrhiza-forming fungi in the nourishment of wood plants.** *Transl. For. Prod. Lab. Can.* No. 49571, [*n.d.*]. pp. 27. 25 refs. Transl. from *Izv. Akad. Nauk SSSR* (*Ser. biol.*) 1957 (3), (317–30). [See *F.A.* 19 No. 177.] Limited distribution.

1542. LUNDEBERG, G. **The relationship between Pine seedlings (*Pinus sylvestris* L.) and soil fungi. Some experiments with a new method for sterilized water cultures.** *Svensk bot. Tidskr.* 54 (2), 1960 (346–59). 12 refs. [E.e.] O.B.D.

Beakers or wide-necked E-flasks, with a fused capillary tube near the bottom, are filled with sterilized nutrient solution. The mouth is closed with a sterile rubber membrane, and seedlings grown in sterile conditions are introduced through holes pierced in the membrane, so that the roots remain in sterile conditions while the shoots grow freely in the open air. The preliminary results are presented of experiments in which Pine seedlings were inoculated with 3 *Boletus* spp. and *Psalliota arvensis*. *Boletus* spp., which in nature normally create ectotrophic mycorrhizae, can, in sterilized water culture, give rise to other forms of "symbios," e.g. pseudo-mycorrhizae. *P. arvensis* stimulates growth in both roots and shoots of Pine.

1543. EGLĪTE, A., and JĀKOBSONE, Z. Grūti šķīstoši minerali un organiskās vielas kā barības avots miķorizas sēnēm un kokiem. **[Slowly soluble minerals and organic matter as a nutrient source for mycorrhizal fungi and for trees.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (223–35). 26 refs. [Latv. latv.russ.] N.L.L.

Experiments with pure cultures of *Boletus bovinus*, *B. variegatus* and *B. granulatus* showed that they are able to utilize $Ca_3(PO_4)_2$, $Fe_3(PO_4)_2$, $AlPO_4$, nucleic acid, and phytin as sources of P; mica and slowly soluble silicates of gravel as sources of K; nucleic acid, peptone and the NH_4 salt of phytin as sources of N; and glucose, sucrose and mannitol (but not cellulose and phytin) as sources of carbohydrates.

1544. SHEMAKHANOVA [ŠEMAHANOVA], N. M. **Nature of mycotrophy of woody plants.** *Trudy Instituta Mikrobiologii, Akademija Nauk Latvijskoj SSR* No. 7, 1958 (57–66). [Russ.?] From *abstr.* in *Chem. Abstr.* 54 (13), 1960 (13290). P.R.

Describes experiments to determine the value of vitamins as stimulants of seed germination and seedling growth of Pine. After treating sterilized seed for 3 hours with solutions of varying concentrations of pantothenic and nicotinic acids and biotin, germination increased 20–24% and seedling length was greater. Repeat experiments with the above plus sand and nutrient gave increases of 22% in seedling length, 13% in number of needles, 9% in dry wt. of stem, 21% in dry wt. of roots, and 12% in total dry wt., vs. controls. *Boletus luteus* and *B. bovinus* produced pantothenic and nicotinic acids and biotin, and *Cenococcum graniforme* produced pantothenic acid, all of which stimulated germination and seedling growth and caused dichotomy and branching of growing rootlets. Fungi not forming mycorrhizae did not possess these properties.

1545. AHROMEJKO, A. I. Novye dannye o roli mikorizy v pitanii drevesnyh rastenij. **[New data on the role of mycorrhizae in the nutrition of woody plants.]** *Lesn. Hoz.* 12 (10), 1960 (27–31). 2 refs. [Russ.]

Describes the use of radio-active isotopes to determine the influence of mycorrhizae on the uptake and accumulation of P by seedlings of Oak, Pine and Birch [cf. *F.A.* 19 No. 78; 21 No. 1542]. Results, presented in tables and graphs, showed that at first, when mycorrhizae and rhizosphere bacteria ("bacteriorhizae") are vigorous, they actually reduce the absorption of moisture and nutrients into the plant; but later, as they start to die off, they greatly increase the uptake of moisture and nutrients by the plant.

1546. MOSER, M. Der Einfluss tiefer Temperaturen auf das Wachstum und die Lebenstätigkeit höherer Pilze mit spezieller Berücksichtigung von Mykorrhizapilzen. **[The effect of low temperatures on the growth and biological activity of higher fungi, with special reference to mycorrhizal fungi.]** *Sydowia, Annales Mycologici Ser. II, Horn* 12 (1/6), 1958 (386–99). 19 refs. [G.] L.S.

Presents data on (*a*) the resistance of the mycelia of >100 species or strains of fungi to temperatures of −11° C. for periods from 5 days to 4 months (i.e. to conditions obtaining at high altitudes in winter), and (*b*) their ability to grow at 0° and 5°. In general, fungi fructifying in early spring or late autumn, fungi from high altitudes, and most wood-inhabiting fungi (including *Armillaria mellea*, *Fomes annosus*, *Lenzites*, *Pleurotus*, *Pholiota*, and *Polyporus* spp.), proved highly resistant in both respects, but reaction to (*a*) and (*b*) did not always follow a consistent pattern. Considerable difference was also found between high- and low-altitude strains of the same fungus. The need for ecologically adapted strains for mycorrhizal inoculation of plants intended for mountain afforestation is stressed [cf. *F.A.* 20 No. 2931].

1547. SUBBA-RAO, N. S., and SLANKIS, V. **Indole compounds in Pine mycorrhiza.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (386). O.B.D.

In an attempt to demonstrate the presence of indole compounds in Pine mycorrhizae formed in nature, whole root systems of 2-year-old White Pine seedlings were treated with reagents known to react with indole derivatives. Of the reagents tested, Ehrlich's reagent (*p*-diaminobenzaldehyde in 1N HCl) imparted intense red coloration to mycorrhizal short roots and the swollen ends of mycorrhiza-bearing mother roots. The presence of indole compounds in mycorrhizal roots was also demonstrated by paper chromatography. None of the short roots of a 4-month-old Pine seedling grown aseptically showed the characteristic intense red coloration when tested with the reagent. Therefore, it is presumed that the observed predominance of indole compounds in mycorrhizal roots is a result of reaction between the symbionts.

1548. ULRICH, J. M. **Auxin production by mycorrhizal fungi.** *Physiol. Plant., Copenhagen* 13 (3), 1960 (429–43). 29 refs. [E.]

Studies on 11 mycorrhizal fungi permitted their classification into 3 groups on the basis of their indole metabolism: (1) *Boletus granulatus*, *B. bovinus*, *B. felleus*, *B. luteus*, *B. variegatus*. These produced IAA even without tryptophan, if the mycelium was provided with a medium for rapid growth; but slow-growing species required tryptophan to produce a measurable amount of IAA. Other indole compounds were not often detected. (2) *B. badius* produced IAA from tryptophan in short-term experiments, but in experiments lasting more than a few days, IAA was no longer detected. Other compounds having the indole nucleus were found on the chromatograms, but their identity is not known. *Coprinus comatus* was shown to have an active IAA oxidase system, converting IAA into at least 11 other compounds in 24 hours. One of these compounds was probably indole aldehyde. (3) *Amanita caesaria*, *A. frostiana*, *A. muscaria*, and *A. rubescens* produced IAA, with many other indole compounds not yet satisfactorily identified.

1549. ULRICH, J. M. **Effect of mycorrhizal fungi and auxins on root development of Sugar Pine seedlings (*Pinus lambertiana*, Dougl.).** *Physiol. Plant., Copenhagen* 13 (3), 1960 (493–504). 20 refs. [E.e.]

The purpose of the study was to see if either a mycorrhizal association or auxin application would cause the roots of Sugar Pine seedlings to branch dichotomously. It was found that neither IAA nor *Boletus badius* nor *B. variegatus* applied to the roots in nutrient solutions resulted in dichotomy, but that seedlings grown aseptically for 6 months in the dark developed dichotomously branched short roots, and that indoleacetonitrile (IAN) caused dichotomy after 2 weeks' treatment. To discover why IAA had no effect on the branching of short roots, the nutrient solutions were tested for auxins. After 2 weeks, extracts of $10^{-5}M$ and 10^{-6} M IAA in which sterile seedlings had grown gave negative results, suggesting that Sugar Pine seedlings possess enzymes capable of destroying exogenous IAA unless the concentration is too high ($10^{-4}M$). IAA did not spontaneously disappear from sterile nutrient solutions that did not contain a seedling. The extract of sterile IAN solutions in which seedlings had grown for 2 weeks showed both an IAN and an IAA spot on the chromatogram. Tests to discover which part of the plant caused this, showed that roots, stems and leaves of the Pine are all capable of converting IAN to IAA. It is considered likely that the inhibition of root growth that occurred in the presence of *B. badius* or *B. variegatus* was not due to the presence of IAA secreted by the fungus. [Cf. V. Slankis in *F.A.* 20 No. 2756.]

1550. BAYLIS, G. T. S. **Effects of vesicular-arbuscular mycorrhiza on growth of *Griselinia littoralis* (Cornaceae).** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (25). [E.] O.B.D.

G. littoralis is normally heavily infected by a vesicular-arbuscular phycomycete that occurs less abundantly in numerous other New Zealand trees. It has not been induced to make more than transient growth into agar, but has survived in soil kept moist for 26 months. In partially sterilized soil in which ectotrophic mycorrhizae were necessary for sustained growth of *Pinus radiata*, development of vesicular-arbuscular mycorrhizae proved necessary for sustained growth of *G. littoralis*, but a non-mycotrophic tree, *Myrsine australis*, grew steadily. The inoculum used to establish mycorrhizae upon *G. littoralis* did not stimulate its growth when mycorrhizae were not formed; it produced no symbiotic infection in *P. radiata* and only traces of it in *M. australis*, and it depressed the growth of both these species. Chemical analyses indicated that the main factor limiting growth in these experiments was availability of P. Mycorrhizae of *G. littoralis* and *P. radiata* produced closely comparable increases in P uptake.

1551. ARNOLD, B. C. **Mycorrhizal infection of germinating seedlings of *Nothofagus solandri* var. *cliffortioides* (Hook f.) Poole.** *Pacif. Sci.* 14 (3), 1960 (248–50). 4 refs. E.M.B.

Describes the development of mycorrhizae on seedlings of var. *cliffortioides*. Superficial mats of mycelium were found at the early stage of seedling growth, but intracellular penetration did not appear until the stage of lateral root emergence. Mycorrhizal association of *N. s.* var. *cliffortioides* seems to reach its highest intensity where humus is abundant.

181.36. Root Relations and Root Development etc.

See also Nos. 1408, 1419, 1557, 1953, 1965, 2117.

1552. **[Bibliography on the root systems of forest trees (up to 1955).]** *J. Jap. For. Soc.* 40 (5), 1958 (202–23). 412 refs. [Jap.]

A review of the literature with a list of 87 Japanese references and 325 foreign references arranged alphabetically by author.

1553. Polge, H. Sensibilité relative du sapin pectiné et de l'épicéa commun aux coups de vent. **[The relative susceptibility of *Abies alba* and *Picea abies* to windthrow.]** *Rev. for. franç.* 12 (10), 1960 (637–42). [F.]

Observations in a forest in the Vosges, which suffered severely from windthrow in a storm in 1958, showed that, contrary to the usual opinion, Spruce was more wind-firm than Silver Fir. It is concluded that this is due to the local topography, with a relatively shallow soil over rock, which prevents the Fir from developing a taproot, whereas the spreading superficial root system of the Spruce is not impeded.

1554. Rahteenko, I. N. Sezonnyj cikl rosta aktivnyh kornej drevesnyh porod. **[The seasonal cycle of the growth of active roots of tree species.]** *Lesn. Hoz.* 12 (9), 1960 (25–6). [Russ.]

Studies were made of the changes in root growth over three seasons for pure plantations 5–6 and 25 years old of *Tilia cordata*, *Quercus robur*, *Acer platanoides*, *Pinus sylvestris*, *Picea abies*, *Larix sibirica*, *Betula verrucosa* and *Caragana arborescens*, and results are graphed for 6-year stands (except *B. verrucosa*) for the year 1955. There was considerable interspecific variation in the root growth cycle, duration of growth and rest periods, and length of root growth. [Cf. *F.A.* 20 No. 2434.]

1555. Gailis, J. Priedes, bērza un alkšņa sakņu sistemu īpatnības mazauglīgo smiltsaugšņu apmežojumos. **[The root system of Scots Pine, Birch, *Alnus incana* and *A. glutinosa* in mixed stands on infertile soils.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (13–59). 65 refs. [Latv.russ.] N.L.L.

Vertical and horizontal diagrams of the root systems are drawn, on the basis of excavations of 83 sample trees (aged 3–25 years). In early life, the feeding area, total root length and root volume are greatest in *A. incana*, decreasing in the order *A. glutinosa*, Birch, Pine; by 18–25 years the Alders have lost ground and the order becomes Birch, Pine, *A. incana*, *A. glutinosa*. Interspecific differences in the root systems are discussed, and it is concluded that all three broadleaved species are useful associates for Pine in plantations, improving soil fertility and assisting the development of the Pine's vertical roots. On infertile sandy soil, *A. incana* is more vigorous than *A. glutinosa*, but Birch is easily the best. Birch should be introduced into Pine plantations in small groups (5 × 5 m.) or in strips ca. 5 m. wide; Alder can be introduced in single rows.

1556. Rudnov, E. V., and Ždannikova, E. N. Mikroflora rizosfery berezy i eli na različnyh počvah srednej tajgi Vologodskoj oblasti. **[The rhizosphere microflora of Birch and Spruce on various soils of the central taiga in the Vologda region.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (69–79). 16 refs. [Russ.russ.]

The studies, during 1956–58, covered Birch and Spruce on (*a*) peaty-humus, and (*b*) podzolic soils, and Spruce on (*c*) peat-bog soils. Results, presented in tables and histograms, show that microbiological processes are more intensive within the rhizosphere than outside it; that the composition of the rhizosphere microflora is determined by the tree species and soil type; that on both (*a*) and (*b*) the Birch rhizosphere has more abundant micro-organisms than that of Spruce; and that there are quantitative seasonal changes in the composition of the rhizosphere microflora. The rhizosphere microflora is held to reflect the suitability of a tree species for its environment.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 1408, 1567, 1591–2, 1594–6, 1743.

1557. Sūna, Ž. Veco priežu sakņu ietekme uz paaugu silā. **[Effect of the root system of old Pines on the increment of advance growth.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (83–105). [Latv.latv.russ.] N.L.L.

Includes stand enumeration data, quantity and quality of advance growth, light conditions, root relations, etc. in Scots Pine stands 90–120 years old, density ≯0·6, site class III, near Riga.

1558. Lutz, H. J. **Effect of red squirrels on crown form of Black Spruce in Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 42, 1958. pp. 3. 4 refs.

Describes the tufting in mature crowns of *Picea mariana* caused by pruning by *Tamiasciurus hudsonicus* and discusses the conclusion that this clearing of branches from a narrow band 3–4 ft. from the tip, protects the cones at the top in forest fires, thus favouring regeneration thereafter.

181.5. Reproductive Behaviour

See also Nos. 1434–5, 1439, 1580, 1657 *et seq.*

1559. Yanagihara, T. **[On the time of flower bud differentiation of Japanese Larch (II).]** *J. Jap. For. Soc.* 41 (5), 1959 (164–6). 4 refs. [Jap.jap.e.]

Using the method already described [see *F.A.* 22 No. 261], summarizes and compares the results obtained in 1958 with those for 1957.

1560. Wareing, P. F., and Longman, K. A. **Studies on the physiology of flowering in forest trees.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (109–10).

[Cf. *F.A.* 20 No. 263; 21 No. 2871.] It has been found that in Scots Pine and Birch, long-day conditions increase the production of both ♂ and ♀ flowers; in Beech and Japanese Larch, no effects of day-length on flowering were detected, while in Lodgepole Pine short-day conditions appeared slightly to stimulate flower production. By manipulating day-length and temperature, great increase of growth can be obtained, e.g. 5 ft. in one season in Beech grafts, and 17 ft. in two seasons for seedling Birch. Branch girdling on Birch produced heavy flowering, but partial breaking of the branches did not stimulate flower production. In experiments to test effects of N, P, and K fertilizers on cone production in Scots Pine, K increased both the number of cones and the proportion of trees producing them.

1561. SANTAMOUR, F. S., JR. **Bisexual conelets in Spruce**. *Morris Arboretum Bulletin, Philadelphia* 10 (1), 1959 (10–1). L.S.

The discovery of numerous bisexual conelets on *Picea montigena* in spring 1958, prompted a survey of all Spruce species in part of the experimental area of the Northeastern Forest Experiment Station. Of 17 fruiting species, a total of 11 trees representing 7 species was found with bisexual conelets. The characteristics of these, including a high degree of pollen abortion and no filled seed, are described. No such conelets had been found on the trees studied during 10 years of observation.

1562. EINSPAHR, D. W. **Abnormal flowering behaviour in Aspen**. *Iowa St. Coll. J. Sci.* 34 (4), 1960 (623–30). 15 refs. O.R.E.

Describes and illustrates branched staminate catkins and hermaphroditism in *Populus tremuloides* and late flowering in *P. grandidentata* and *P. tremuloides*.

1563. EINSPAHR, D. W., and JORANSON, P. N. **Late flowering in Aspen and its relation to naturally occurring hybrids**. *For. Sci.* 6 (3), 1960 (221–4). 8 refs.

Reports, with illustrations, the flowering of some ♂ and ♀ catkins of *P. tremuloides* 10 days later than the others on the same branches. It is suggested that the occurrence of such late-flowering catkins may provide a method by which the usual differences in time of flowering between *P. tremuloides* and *P. grandidentata* may be bridged in nature. This might explain local hybridization with *P. grandidentata* [see *F.A.* 17 No. 2481].

1564. KREČETOVA, N. V. K biologii cvetenija i oplodotvorenija *Phellodendron amurense* Rupr. **[The biology of flowering and fertilization in *P. amurense*.]** *Bot. Ž.* 45 (9), 1960 (1336–40). 1 ref. [Russ.]

P. amurense is dioecious, and has two main forms, one with light-green flowers, the other with reddish-brown or even raspberry-coloured flowers. The start and duration of flowering of ♀s and ♂s of both forms is directly related to temperature and r.h. An air temperature of 20–25° C. and r.h. of 44–58% makes for harmonious flowering, ovary development, and viable pollen; temperatures < 20° and r.h. > 60% destroy pollen viability and prevent fruit formation.

1565. ELAGIN, I. N. Materialy k izučeniju plodonošenija duba v perestojnyh dubravah. **[A study of the fruiting of Oak in overmature stands.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (80–7). 12 refs. [Russ.]

The study was made in the Tellerman forest in (1) Oak/Ash/*Aegopodium*/*Carex*, (2) Oak/Ash/*Aegopodium*, and (3) Oak/*Rubus caesius* stands, the Oak on all three sites being 180–220 years old. Data are tabulated on the numbers of acorns, dates of fall, and acorn quality. Results showed that the first healthy acorns begin to fall when the first yellow leaves appear in the crowns (in this region, late Sept.). Mass acorn fall begins when about half the leaves have their typical autumn colouring, and lasts until all the leaves are yellow. The last acorns fall with the Oak leaves. About half the acorns forming in the crown (in all forest types) are killed by insects and diseases. There are usually more acorns, of all fractions, on the S. than on the N. side of the crown.

1566. SUCOFF, E. I., and CHURCH, T. W., JR. **Seed production and dissemination by Virginia Pine**. *J. For.* 58 (11), 1960 (885–8). 4 refs.

In studies in Maryland and West Virginia, seed dissemination from the N., E., S. and W. edges of an uncut block of 35-year-old *Pinus virginiana* was measured in 1952–54. Annual seed-fall from many stands, including 4 seed-tree cuttings and 2 strip cuttings, was sampled, beginning in 1950. Observations were made on annual variations in seed production, and on time of seed-fall. Results showed that: most seed was distributed by the prevailing winds, and fell within 100 ft. of the stand producing it; a shortage of good seed-trees can be offset only in part by leaving more seed-trees per unit area, owing to the scarcity of good seed-producers; during the period 1950–58, the best seed-years were 1950, 1953, 1957, and 1958, no rhythm being noted; release of seed-trees may stimulate seed production; variations in production amongst individual trees and stands is often great; seed falls from late October to the following May, most of the sound seed falling in October, November, and December. *From authors' summary.*

1567. BEAUFAIT, W. R. **Some effects of high temperatures on the cones and seeds of Jack Pine**. *For. Sci.* 6 (3), 1960 (194–8). 7 refs.

Tests were conducted which showed the dependence of cone opening on ambient atmospheric humidity. Cone m.c. was found to vary in nature from 350% of oven-dry weight when green to 7% when mature. Mature cones were found to be at equilibrium with atmospheric moisture. Further desiccation of cones at extremely low temperatures was achieved under laboratory conditions, but the stresses incurred failed to break resinous seals on the cone scales. Cones taken from serotinous trees in all parts of N. Lower Michigan were exposed to temperatures ranging from 200° F. in 100° intervals for periods up to 5 min. They responded consistently by opening in a range from 80 sec. at 200° to 2 sec. at 1300°; they ignited in 60 sec. at 700° and in 2 sec. at 1300°. Ignited cones retained no viable seed, but unignited ones suffered little reduction in germinative capacity of their seeds. Normally extracted Jack Pine seeds were also exposed to high temperatures, and remained viable until the wings ashed and the seed-coats cracked from the heat. The results suggest that the high temperatures occurring in the crowns of standing trees during prescribed burns will not impair the viability of the seeds in serotinous cones, but should aid their dispersal. *From author's summary.*

1568. SCHMIDT, H. Untersuchungen über die Reifung des Samens der Fichte (*Picea abies* L.) im Hochgebirge. **[Investigations on the ripening of Spruce seed in high mountains.]** *Forst- u. Holzw.* 15 (18), 1960 (366–70). 1 ref. [G.]

Cones were collected at 600 and 1100 m. alt. on N.

and S. aspects, and also at 1600 m. on a S. aspect, from 10 Sept. to 28 Oct. 1958. The moisture content of the cones, and the germinative capacity of the seeds (both when harvested, and after a year's storage in the cones) were determined. Seed colouring was also examined. There were no decisive differences between N. and S. aspects, though germinability developed earlier in seeds from the S. aspect at 1100 m. than in those from the N. slope. At low altitudes, max. germinative capacity, a cone m.c. of 40%, and brown seed colouring all occurred fairly closely together at the end of Sept., but diverged with increasing altitude; at 1600 m., full germinative capacity was reached first (early Oct.) and brown colouring and a cone m.c. of 40% much later (end of Oct.).

1569. KEAY, R. W. J. **Seeds in forest soils.** *Niger. For. Inform. Bull.* Nos. 4–7, 1960 (1–12).

Soil from the Usonigbe and Omo Forest Reserves was placed in 4 boxes, and the seedlings that appeared were counted and identified 3, 6 and 12 months after collection. Some 40 species (14 trees and the rest shrubs or weeds) were counted. *Nauclea* [*Sarcocephalus*] *diderrichii* and *Terminalia superba* (one seedling of each) were the only economic species identified.

1570. **Seed germination [of *Acacia senegal*].** *Extr.* from *Rep. For. Dep. Sudan 1958/59*, 1960 (85).

A characteristic of the seed of this species is that about half will, on being wetted, germinate within 48 hr., while the other half will remain for up to 15 days before germination. This difference is found not only in seed from the same tree but also in seed from the same pod. It is a natural provision for a species growing in a region of low and variable rainfall.

1571. BARTELS, H. Über die Physiologie der Samenkeimung. **[The physiology of seed germination.]** *Forst- u. Holzw.* 15 (18), 1960 (363–6). [G.]

A general discussion, using *Pinus nigra* seed as an example.

1572. SILEN, R. R. **Lethal surface temperatures and their interpretation for Douglas-Fir.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (404). O.R.S.

Measurements by temperature pellets in 1954 on 8 clear-felled areas in W. Oregon showed that, by September, 50·5% of N. and 86·5% of S. slopes had exceeded 138° F. Over 90% of S. slopes exceeded 125°. A study of the 100 points sampled on each area showed that most micro-sites not reaching 138° were in perpetual shade and others were on steep northerly aspects or in shade of dense or low vegetation. Vegetation giving intermittent shade provided little protection against high surface temperatures. When temperature pellets were placed near the stem of Douglas-Fir seedlings, and heat injury was studied in relation to the melting of the pellets, the 138° pellet proved to be the most closely related to mortality, but temperatures causing death in the field seemed to vary from 125° to $>150°$. In the laboratory, when seedlings were exposed in a temperature gradient under tungsten lamps, seedbed material and duration of exposure were major factors affecting mortality, but the effect of seedling age up to 3 months was not significant. Exposure of seedling stems to water-bath temperatures in dry conditions, with a new apparatus, gave a time/temperature relationship at which mortality occurred, with lower corresponding values than those in dry materials tested. Heat-lamp tests on 49 materials indicated that there is probably a complete spectrum of such time/temperature curves. Seedling mortality occurred as low as 122° after 4 hours' exposure to water-bath temperatures and as high as 176° after 15 min. exposure in white sand. There was little evidence of a strong display of natural resistance by individuals; resistance in the field could be explained by short duration of exposure or seedbed materials with protective qualities. Further studies showed that transpiration had no measurable effect on lethal temperatures. Thermocouples placed in seedling stems indicated no biological mechanism that might keep the stems cooler than surrounding surface temperatures. The 138° pellet appeared to be a reliable indicator of probable heat mortality on clear-felled areas, for durations of exposure and seedbed materials near the mean listed for the 8 areas in the study. Other conclusions are that lethal temperatures vary with the material surrounding the seedling, that heat in calories instead of actual temperature is probably the correct measure of heat injury, and that relatively more heat is transferred at the same temperature into a seedling in organic than in mineral soils.

1573. OVINGTON, J. D., and MACRAE, C. **The growth of seedlings of *Quercus petraea*.** *J. Ecol.* 48 (3), 1960 (549–55). 2 refs.

Compares the effects of canopy density and soil conditions on the growth of *Q. sessiliflora*. Data are given on the form, dry weight, and nutrient contents of seedlings grown in boxes containing 14 different soils from the Lake District and placed under 3 different intensities of cover (85, 45, and 15% of light intensity in the open). Cover proved to be more effective than soil type in controlling seedling growth. Data on the nutrient contents of the acorns and growing seedlings indicate that the relative insignificance of the effect of soil type may be partly due to the large nutrient reserve in the acorn, which is not exhausted until the second year after germination. The results are considered in relation to the natural regeneration of Oak woods in Britain.

1574. ASHTON, D. H. **Growth under shade and the compensation points of *Eucalyptus regnans*.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (10). O.B.D.

In the mature, even-aged, pure forests of S.E. Australia, natural regeneration of *E. regnans* is rare unless extensive openings of the canopy are caused by fire. The light-compensation points were investigated in both the laboratory and the greenhouse. The light intensity at which net gas exchange was zero was called the absolute compensation point. This greatly increased with temperature and the developmental sequence of seedlings, and decreased slightly with high CO_2 concentration and low carbohydrate status. The average light intensity at which the net assimilation rate was zero was called the seasonal compensation point. This fell sharply from summer to winter and was correlated with the mean temperature. The effects of shade were greatest at daylight values <20–30%. Seedlings were etiolated at 11%, and stunted at 5% and at the seasonal compensation point at 1½% daylight. Root growth and mycorrhizal frequency were greatly reduced below 11% daylight. In the forest, survival under light and moderate shade is dependent on wallaby grazing, summer soil moistures, and winter leaf-spot fungi. The reduction of light intensities and sunfleck frequency in autumn and winter is vital, particularly where seedlings have developed vertically orientated foliage. [Cf. *F.A.* 20 No. 2912.]

1575. Régénération naturelle des principales essences. **[Natural regeneration of the principal forest tree species [in the Belgian Congo].]** *Extr.* from *Rapp. Inst. Nat. Étude Agron. Congo Belge 1959*, 1960 (106–7). [F.]

Observations were made over a period of 30 months to determine the light requirements of seedlings of *Entandrophragma cylindricum*, *Gossweilerodendron balsamiferum*, *Gilbertiodendron dewevrei* and *Afrormosia elata*. Dry weight of plants increased with increasing relative illumination, differences between treatments becoming accentuated with increasing age, especially in light-demanding species. Under the conditions of the experiment, a relative illumination of 50% generally gave the best results. Thinnings of different intensities carried out in the upper storey showed that illumination has the same influence on natural regeneration of *A. elata*.

1576. BAGLEY, W. T., and READ, R. A. **Some temperature and photoperiod effects on growth of Eastern Redcedar seedlings.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (595–602). 6 refs. O.R.E.

Eastern Redcedar seedlings grown at daytime temperatures of 90° F. responded differently in top and root growth to four combinations of night temperature and photoperiod. Greatest growth and highest top/root ratios were obtained by a diurnal fluctuation from 90° to 59° with a 20-hour photoperiod (long-moderate). A diurnal fluctuation from 90° to 45° with a 20-hour photoperiod (long-cold) produced the smallest seedlings with the lowest top/root ratios. Heights and weights at 59° (moderate) night temperature were significantly greater under 20-hour (long) photoperiod than under 14-hour (normal) photoperiod. Variation in growth response within treatment was greatest under the 90° to 45° (long-cold) and least under the 90° to 80° (long-hot) temperature regime. Seedling heights and top/root ratios tended to equalize after 6 months in an outdoor environment, but significant differences in total weight did not change. *Authors' summary.*

1577. BRUNK, E. L., and HANSBROUGH, T. **Effect of temperature and light intensity on the germination of Sycamore, Sweetgum and American Elm seed.** *LSU For. Note La. Agric. Exp. Sta.* No. 39, 1960. pp. 2. 4 refs.

Describes a factorial experiment with temperature ranges of 35–60, 60–85, and 85–100° F., and light or dark conditions, to test the hypothesis that the trend, observed in Southern bottomlands, for stands where *Ulmus americana* (1) predominates to succeed pure *Platanus occidentalis* stands (2), is due more to seedbed conditions favouring (1) than to its greater general tolerance [cf. *F.A.* 15 No. 2345]. Germination % of (1) after 21 days at low and medium temperatures (which characterize the season of germination) was more than twice that of (2). Sweetgum [*Liquidambar styraciflua*] germination was nil at low, but $\geqslant 90\%$ at medium temperature, and at high temperatures in the dark.

1578. HOSNER, J. F. **Relative tolerance to complete inundation of fourteen bottomland tree species.** *For. Sci.* 6 (3), 1960 (246–51). 9 refs.

[Cf. *F.A.* 21 No. 2881.] The following order of tolerance was found in potted seedlings, mainly of Illinois provenance, totally immersed in tanks for 5, 5 + 5 . . . 30 days then placed in a greenhouse to recover: *Acer saccharinum*, *Cephalanthus occidentalis*, *Acer negundo*, *Salix nigra*, *Populus deltoides*, *Fraxinus pennsylvanica*, *Ulmus americana*, *Quercus palustris*, *Platanus occidentalis*, *Acer rubrum*, *Quercus shumardii*, *Liquidambar styraciflua*, *Celtis occidentalis*, *Quercus falcata* var. *pagodaefolia*. The majority of each species survived 5 days' immersion. Those in which a majority died after 10, 20, and 30 days were the last two and Nos. 8 and 10, respectively. Site and water factors not included in the trial are adduced to explain the anomalous positions of the Silver and Red Maples, the Cottonwood and *Liquidambar*. Seed of Red Maple may be of an upland ecotype.

1579. HORTON, J. S., MOUNTS, F. C., and KRAFT, J. M. **Seed germination and seedling establishment of phreatophyte species.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 48, 1960. pp. 26. 5 refs.

Evaluates factors influencing germination and establishment of phreatophytes in the Southwest (U.S.A.), with particular reference to *Tamarix pentandra*, and suggests means of reducing the spread of undesirable species by manipulation of water flow. [Cf. *F.A.* 21 No. 1374.]

181.6. Life Form, Habit. Post-Seedling Development and Form

See also No. 1558.

1580. FIELDING, J. M. **Branching and flowering characteristics of Monterey Pine [*Pinus radiata*].** *Bull. For. Timb. Bur. Aust.* No. 37, 1960. pp. 59. 37 refs.

Summarizes studies of a number of morphological characteristics of *P. radiata* that are of importance to foresters and researchers working with the species. Almost all the investigations were made in plantations in the Australian Capital Territory. Variations in the number of whorls of branches on the annual shoot, the length of the internodes, the size and angle of the branches, the number of branches in the whorl, and apical dominance are described, and correlations between these and other characteristics discussed. Estimates of gross heritability of a number of characteristics, based on clonal plantations, are given. Flowering characteristics dealt with include variations in sexuality, characteristics associated with the sex of the tree, the amount of growth energy devoted by *P. radiata* plantations to reproduction, the age when flowering begins, the ontogeny of the flowers, and their position on the shoots. The time and duration of flowering, variations in the number of flowers produced, and the flowering of the species in relation to selection are also discussed. *From author's summary.*

1581. ECHEVERRÍA BALLARIN, I. Pinares del Norte—la nudosidad de la madera y modo de evitarla. **[Pine stands of the North—knottiness in the wood and ways of avoiding it.]** *Manual Técnico, Sección de Capacitación, Dirección General de Coordinación, Crédito y Capacitación Agraria, Ministerio de Agricultura, Madrid* No. 23*E*, 1959. pp. 62. 18 refs. [Span.]

Deals with causes of excessive branching in *Pinus radiata* and the consequent defects in the wood, and presents information on the best ways of dealing with the problem, by maintaining correct spacing, by pruning, and by selecting good strains. The booklet includes a short obituary notice of the author and a list of his published works.

1582. KRIGUL, T. Männipuistute laasumisest parematel boniteetidel (I–III). **[Self-pruning in Scots Pine stands on better (I–III) sites.]** *Loodusuur. Seltsi Aastar., Tallinn* No. 51, 1958 (1959), (61–72). 6 refs. [Est.russ.g.] N.L.L.

Discusses the relation between clear bole length, d.b.h., and tree height. Studies were made in 118 stands, in which the clear length, length to living branches, and tree length were measured. Results are tabulated. Self-pruning appears to be much better in Estonia than in the Ukraine and Central Russia, but is still not adequate, and artificial pruning could increase considerably the % of high-quality knot-free wood in the stem.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See No. 1411.

181.8. Phenology

See Nos. 1403, 1410, 1413–5, 1432, 1436, 1439–42, 1554, 1559–60, 1562–5, 1847, 2346, 2357–8.

181.9. Miscellaneous (Including the Ecological Rôle after Death of Plants or Parts of Plants)

1583. ANGERER, J. Eine bemerkenswerte Pilzgesellschaft auf Pappelholz. **[A noteworthy fungal association on Poplar wood.]** *Bericht der Bayerischen Botanischen Gesellschaft zur Erforschung der Heimischen Flora, München* 32, 1958 (141–2 + 2 plates). [G?] From *abstr.* in *Rev. appl. Mycol.* 38 (7), 1958 (427–8).

In a 3-year study of the succession of larger fungi on a large number of young Poplar trees which had been uprooted and left to rot, *Merulius papyrinus* and *Trametes lactea* were found to be dominant, both being very common and present on both branches and twigs. Significantly less frequent was *Stereum spadiceum* on branches, twigs, and rootstocks. A further 9 species are recorded, 7 of them well known; it was not unusual for up to 7 species to occur on a sapling only 1–1·5 m. long.

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 1508, 1513, 1605–6, 1617.

1584. PEARSON, M. C. **Muckle Moss, Northumberland. I. Historical.** *J. Ecol.* 48 (3), 1960 (647–66). 20 refs.

Includes a detailed account of pollen analyses, largely concerned with tree pollen.

1585. GULISAŠVILI, V. Z. Perigljacial′naja rastitel′nost′ dolinnyh lednikov Kavkaza i ee rol′ v poslelednikovom razvitii lesnyh soobščestv. **[Periglacial vegetation of the valley glaciers of the Caucasus, and its role in the post-glacial development of forest communities.]** *Bot. Ž.* 45 (9), 1960 (1249–58). 25 refs. [Russ.e.]

The periglacial vegetation on newly formed moraines and eroded slopes consists of open communities of *Betula* spp., *Pinus sylvestris* var. *hamata*, *Salix* spp., and herbaceous plants. As soil formation progresses, these open, uneven-aged communities gradually change into closed, even-aged stands of Birch and Pine. The indications are that a similar development of the vegetation took place in the glacial period as the glaciers retreated.

1586. WALKER, P. C., and HARTMAN, R. T. **The forest sequence of the Hartstown Bog area in western Pennsylvania.** *Ecology* 41 (3), 1960 (461–74). 46 refs.

Discusses pollen profiles in this area and the successions they reveal.

1587. **A study of the ecology of the peat swamp forests of Sarawak and Brunei.** *Extr.* from *Rep. For. Dep. Sarawak 1959*, 1960 (25–6).

A pollen analysis was made of a core, 13 m. in depth, from a highly developed mixed bog formation in the Marudi area. Preliminary results indicated that the peat developed over Mangrove, and the succession of forest types, similar to the horizontal succession across a raised bog, can be interpreted. Radio-carbon dating of material from the same core showed that peat accumulates at a mean rate of 1 ft. in 50 years. The age of the peat at the base of the core was 4270 (±70) years.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 1585–7, 1601, 1609, 1611, 1618, 1622–3, 1626, 1628–9, 1631–7, 1640.

1588. UGGLA, E. Skogsbrandfält i Muddus nationalpark. **[Forest fire areas in Muddus National Park [N. Sweden].]** *Acta Phytogeographica Suecica,* *Uppsala* No. 41, 1958. pp. 116. 152 refs. [Sw.sw. e.*e.*] L.S.

A study of recolonization of burnt areas in virgin forest N. of the Arctic Circle in relation to site conditions, original vegetation, and passage of time, covering the period 1945–58. Most of the twenty 25-m. plots were on an area where a severe fire in 1933 had destroyed all vegetation and humus except in the shelter of boulders. In the tree layer, Spruce was almost completely absent even on former mixed conifer sites, and Scots Pine depended largely on the proximity of seed-trees. In 1945, seedlings per plot declined from 139 near the margin to 15 near the centre of the burn, 138 m. away. Birch, recolonizing freely, suffered severely from elk damage. In the field layer, some species, e.g. *Calluna vulgaris*, appeared to grow from highly resistant seed, others, like *Vaccinium*, regenerated freely from subterranean rhizomes except where the fire had been very severe. The colonization by nitrophilous plants and their decline are described. In the ground layer, *Hylocomium splendens* and *Pleurozium schreberi* were almost completely absent in spite of earlier predominance. *Cladonia* spp. also regenerated slowly. [Cf. *F.A.* 11 No. 2567; 19 No. 3125.]

1589. COUPLAND, R. T., and MAINI, J. S. **Woodland invasion of Western Canadian grasslands.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (81). O.B.D.

Populus tremuloides forms a mosaic with grassland throughout the black-soil zone, to form the Aspen-grove region in the Prairie Provinces. Reports of pioneers have indicated that this invasion of previously open grassland is due to protection from fire during 75 years of settlement. Recent studies have shown that groves existed throughout the region previously, but were inconspicuous because of frequent burning of the grassland. The effect of settlement has been to permit the trees to reach up to 35 ft. in height and 9 in. d.b.h. and for individual groves to expand vegetatively, while new groves have frequently become established near the older ones. The extent of recent invasion of the grassland zone by forest in this region is considered to be insignificant compared with the increase in area already occupied by Dwarf Aspen at the time of settlement. This eliminates one line of evidence used by geographers to support the opinion that the vegetation of the Great Plains is potentially forest.

1590. KUCERA, C. L. **Forest encroachment in native prairie.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (635–9). 1 ref. O.R.E.

In a survey in east-central Missouri, American Elm was the only important, but abundant, species invading the prairie. Densities were inversely proportional to the distance from the bordering forest. Although Oak and Hickory were present therein, their invasion was limited to a narrow fringe area. The absence of any controlling influence (e.g. mowing, burning) is detrimental to the stability of prairie in a humid climate where forest is generally common. *From author's summary.*

1591. AHLGREN, C. E. **Some effects of fire on reproduction and growth of vegetation in northeastern Minnesota.** *Ecology* 41 (3), 1960 (431–45). 23 refs.

Plant succession on plots burned by wild fires and prescribed burning was examined and compared with succession on unburned land. Added nutrients from ash contributed to a lush growth of post-fire vegetation. This vegetation used, and retained, minerals that might have been lost by leaching, and provided conditions suitable for growth of tree seedlings. The seedlings assumed dominance as they became light-tolerant, and the temporary vegetation disappeared. [Cf. *F.A.* 20 No. 4382.]

1592. ARATA, A. A. **Effects of burning on vegetation and rodent populations in a Longleaf Pine/Turkey Oak association in north central Florida.** *Quarterly Journal of the Florida Academy of Sciences, Gainesville* 22 (2), 1959 (94–104). 16 refs. L.S.

Describes the changes in plant development in a *Pinus palustris/Quercus laevis* association after a midwinter burn of ca. 150 acres. Regeneration of *Q. laevis* was considerable. Over the whole area (several hundred acres of typical Pine/Oak land) the level of rodent populations did not decrease, though a shifting of populations occurred after the fire.

1593. LAESSLE, A. M. **A report on succession studies of selected plant communities on the University of Florida Conservation.** *Quarterly Journal of the Florida Academy of Sciences, Gainesville* 21 (1), 1958 (101–12). 5 refs. L.S.

Observations began in 1939, and permanent quadrats were set up in 1951; detailed results are presented, including tables of the principal tree species by diameter classes. During 20 years of fire protection there has been a rapid spread of *Acer rubrum* from the river swamps to the bottomlands, and an extension of *Gordonia lasianthus* to the moister portions of the bottomlands. The drier portions of the bottomlands are being invaded by hammock species, particularly *Quercus virginiana*, though a number of Magnolias and *Tamala pubescens* [*Persea borbonia*] also are growing well in this habitat.

1594. BUDOWSKI, G. **The ecological status of fire in tropical American lowlands.** *Repr.* from *Actas, 33° Congreso Internacional de Americanistas, San José* 1, 1958 (264–78). 31 refs. [E.e.]

Briefly reviews present knowledge of the effects of fire on vegetation, with particular reference to tropical America.

1595. BUDOWSKI, G. Algunas relaciones entre la presente vegetación y antiguas actividades del hombre en el trópico americano. **[Relationship between present vegetation and former human activities in tropical America.]** *Repr.* from *Actas, 33° Congreso Internacional de Americanistas, San José* Vol. 1, 1958 (259–63). 5 refs. [Span.e.]

Reviews very briefly three cases where the present vegetation shows unusual characteristics that can be attributed to ancient human settlement: (1) the status of *Swietenia macrophylla* and *Achras zapota* in the Yucatan forests, where regeneration of the former is poor, while the latter is present in abundance; (2) the Pine stands of Central America where fire has favoured Pine regeneration; and (3) the tropical savannas of the Americas and the rôle of fire in their formation.

1596. GILBERT, J. M. **Forest succession in the Florentine valley, Tasmania.** *Papers and Proceedings of the Royal Society of Tasmania, Hobart* 93, 1959 (129–51 + 2 photos). 44 refs. L.S.

Describes species and age composition of 4 main types: (1) temperate rain forest, consisting chiefly of *Nothofagus cunninghamii* and *Atherosperma moschata*, the climax on all but the poorest sites, whose development depends on freedom from fire for 350–400 years, i.e. the life span of the main forest Eucalypts; (2) mixed forest of Eucalypts with an understorey of rain-forest species, a fire climax in which fires occur at intervals of < 350 years but are not frequent; (3) Eucalypt forest with understorey of *Pomaderris*, *Olearia* and *Acacia*, where fires occur once or twice in a century; and (4) savanna and sedgelands, wherever fires are even more frequent. With all forest types, freedom from fire leads to floristic simplification. Most fires were and are caused by humans.

1597. AHN, P. **Regrowth and swamp vegetation in the western forest areas of Ghana.** *Repr.* from *J. W. Afr. Sci. Ass.* 4 (2), 1958 (163–73). 3 refs.

The author divides the forest regrowth vegetation into a number of units based on age and floristic composition. These are forb regrowth, thicket, secondary forest, and the corresponding units of poorly drained areas—swamp forb regrowth, swamp thicket, and secondary swamp forest. The typical floristic composition of each of these is described, thus tracing the development from the soft-stemmed, leafy weeds that soon appear on abandoned farmland to the mature secondary forest growth that eventually succeeds this. Both the composition of the regrowth and the speed with which it develops are shown to be influenced by the soil, the history of previous cultivation, and the extent to which shade trees and neighbouring areas of forest are left standing. The classification outlined has the advantage of indicating, in addition to floristic composition, the length of time the ground has been left under fallow. It has been found in practice that untrained local staff can quickly learn to recognize the main categories described, while more experienced recorders are able to estimate the age of the regrowth quite closely.

182.3. Units of Vegetation (Associations etc.): Theory

See Nos. 1601, 1607, 1630–1, 1635.

182.4. Layer Communities

See also Nos. 1393, 1631.

1598. BOLÓS, O. DE. El sotobosque arbustivo en la silvicultura mediterránea. **[The shrub understorey in Mediterranean silviculture.]** *Publicaciones del Instituto de Biología Aplicada, Barcelona* 30, 1959 (5–16). 12 refs. [Span.] L.S.

Reviews the ecological and silvicultural rôle played by the shrub understorey in forests, with particular reference to Mediterranean conditions, and describes briefly the flora and characteristics of six types of understorey commonly found in Mediterranean forests.

182.5. Synecological Measurements and Methods

See also Nos. 1630–1, 2269.

1599. PIELOU, E. C. **A single mechanism to account for regular, random and aggregated populations.** *J. Ecol.* 48 (3), 1960 (575–84). 16 refs. of

A mechanism derived from quadrat-sampling model populations simulating forest trees was related to a natural population in open *Pinus ponderosa* woodland in British Columbia.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

1600. LANGER, H. Die Forstgesellschaften im Forstamtsbezirk Sulzschneid (Allgäu). **[The plant communities in artificial forests of Sulzschneid district (Allgäu).]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 8, 1960 (248–62 + 2 tbls.). 27 refs. [G.g.]

A description of the ground vegetation in stands beyond the pole stage, in relation to parent material, soils, age of stands, natural forest communities, etc., in the northern foothills of the Alps, investigated in connexion with site mapping. Both on *molasse* and ground moraine, the chief communities distinguished were an *Oxalis* Spruce forest in the younger stands and *Asperula/Sanicula*, *Mercurialis*, *Vaccinium myrtillus* and *Carex alba* Spruce or Spruce/Beech forests in older stands.

187. Vegetation Types

See also Nos. 1352, 1375, 1391, 1471, 1499, 1504, 1514, 1521, 1534, 1537–8, 1587–97, 1885.

1601. **Symposium on forest types and forest ecosystems during the Ninth International Botanical Congress, Montreal, August 24th 1959.** *Silva fenn.* 105, 1960. pp. 142. 16 pp. of refs. [E.G. or F.]

Includes a number of papers with the title 'Can we find a common platform for the different schools of forest type classification?' by *E. Aichinger*, *T. Arnborg*, *H. Ellenberg*, *V. J. Krajina*, *V. Kujala*, *A. Linteau*, *J. S. Rowe*, and *A. Scamoni*; also the following papers [all in English], with some account of the general discussion, a summing up of the symposium by *V. J. Krajina*, and a bibliography: A combined structural and floristic approach to the definition of forest ecosystems (*P. Dansereau*); Some major problems in vegetation classification (*R. Daubenmire*); Comparison of forest ecosystems (vegetation and soil) in different climatic zones (*G. A. Hills*); Classification of the vegetation, especially of the forest, with particular reference to regional problems (*A. Kalela*); Mapping tropical forest vegetation (*A. W. Küchler*); Some problems of forest climaxes in Poland (*A. Medvecka-Kornaś*); The ecosystem concept as an aid to forest classification (*J. D. Ovington*); The concept of climax in forest botany as applied in India (*G. S. Puri*); The correlation between the concepts 'forest ecosystem' and 'forest biogeocoenose' and their importance for the classification of forests (*V. N. Sukačev*); and a new attempt to classify Australian rain forest (*L. J. Webb*).

1602. MUISTE, L. Kagu-Eesti männi kultuurpuistute tüpoloogiast ja tootlikkusest. **[Forest types and productivity of Scots Pine plantations in S.E. Estonia.]** *Loodusuur. Seltsi Aastar., Tallinn* No. 51, 1958 (1959), (23–42). 15 refs. [Est.russ.g.*russ. g.*] N.L.L.

The main forest types are the *Pinetum piceeto-vacciniosum, P. pleurozio-vacciniosum*, and *P. oxalidosum*. Soils and plant communities are described. Productivity is generally high, being best on the *P. oxalidosum* and poorest in the *P. p.-vacciniosum*. Yields are considerably higher than those given by Ilvessalo in yield tables for Finnish stands.

1603. MATUZANIS, J. Egļu vēra varianti Latvijas PSR. **[Variants of the *Piceetum oxalidosum* in Latvia.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (169–91). 31 refs. [Latv.russ.] N.L.L.

Distinguishes and describes three variants, viz. on the plains, in the hills, and on the outwash plains (*sandrs*).

1604. LINDQUIST, B. **Forest vegetation belts in southern Scandinavia.** *Meddelanden från Göteborgs Botaniska Trädgård (Acta Horti Gotoburgensis), Göteborg* 22, 1959 (111–44 + 1 map). 3 pp. of refs. [E.] L.S.

Discusses the natural Beech, Oak/Spruce and Oak forest regions of S. Scandinavia and their limits, and compares them with the corresponding regions of central and northern Europe.

1605. SCHRETZENMAYR, M. Sekundäre Merkmale mitteleuropäischer Waldhöhenstufen. **[Secondary characters of Central European altitudinal forest zones.]** *Arch. Forstw.* 10 (8), 1960 (730–8). [G.g. russ.e.]

Discusses the features of present-day landscapes from which it is possible to infer the original forest zone—e.g. mixed Oak/Hornbeam (plains zone) or Silver Fir/Beech (montane zone). These features include, in addition to topography, climate, and present vegetation, the distribution of forest, pasture, and tillage, the agricultural crops, types of settlement (e.g. closed village, scattered farms, isolated homesteads), date of settlement, etc.

1606. PASSARGE, H. Waldgesellschaften NW. Mecklenburgs. **[Forest associations of N.W. Mecklenburg.]** *Arch. Forstw.* 9 (6), 1960 (499–541). 57 refs. [G.g.russ.e.]

Presents site-factor and Braun-Blanquet tables for 13 forest associations in an area of 800 sq. km. mainly of loamy moraine, where forests now cover ca. 8% vs. 95% in post-glacial times. From a potential vegetation area-distribution map of Alder, Ash/Beech, *Melica*/Beech, and poor Beech forest, the % distribution, weighted by these areas and association-table data, are Beech 64 (54), Pedunculate Oak 9 (11), Ash 9 (2), Hornbeam 8 (33), Sycamore Maple 5, Alder 4, and Birch 1 (numbers in brackets being %s for post-glacial forest based on pollen diagrams from 7 bogs). For each site type the recommended natural mixtures, stocking and production types are tabulated.

1607. MOOR, M. Zur Systematik der *Querco-Fagetea.* **[The systematics of *Querco-Fagetea.*]** *Mitt. Florist.-Soziol. Arbeitsgemeinsch. (n.s.)* No. 8, 1960 (263–93). 70 refs. [G.g.]

Reviews and discusses the nomenclature and systematics of the Euro-Siberian mixed hardwood communities. According to the author's proposal, the *Querco-Fagetea* consists of the orders *Quercetalia pubescentis, Fagetalia silvaticae* (including *Populion albae*) and *Prunetalia spinosae.* The order *Populetalia albae* is dropped, and the Willow communities are elevated to a separate class, *Salicetea purpureae.*

1608. TRAUTMANN, W., and LOHMEYER, W. Gehölzgesellschaften in der Fluss-Aue der mittleren Ems. **[Woody plant communities in the flood-plain of the middle reaches of the river Ems.]** *Mitt. Florist.-Soziol. Arbeitsgemeinsch. (n.s.)* No. 8, 1960 (227–47 + 3 tbls.). 16 refs. [G.]

Discusses the Osier community (*Salicetum triandra-viminalis*) on the river banks, the forests of the *Fraxinio-Carpinion* on periodically flooded sites with Oak predominating, those of the *Querco-Carpinetum* on occasionally flooded sites with Beech predominating, and the Alder swamps in e.g. dried-up arms of the river, and their zonal arrangement. Beech, absent from other flood-plains of the region, occurs in large stands on permeable sands, but suffered considerable, often lethal, damage in a recent exceptional summer flood.

1609. KÁRPÁTI, I., and KÁRPÁTI, V. **Elm—Ash—Oak grove forests (*Querceto-Ulmetum hungaricum* Soó) turning into White Poplar dominated stands.** *Acta Agronomica Academiae Scientiarum Hungaricae, Budapest* 8 (3/4), 1958 (267–83). 66 refs. [E.e.f.russ.] E.M.B.

Seeks to show that the many stands in which White Poplar predominates on the Hungarian (mainly Danubian) flood-plains are a form of the *Querceto-Ulmetum hungaricum*, developed, after clear cutting, by the greater regenerative vigour of the Poplar, which reproduces not only from coppice but also abundantly from root suckers. Examination of stands in the Czerta region (in which the % of White Poplars decreased from 60–70 at age <10, to 25–30 in the age class 20–25 and 5–10% in older stands, while Pedunculate Oak increased from 4·5% at 10 to 25–50% in the 20- to 70-year stands and up to 80–90% in the stands >70 years old) suggested that, without interference, the stands would return to their old composition in 70 to 100 years. In some areas, Elm or Ash may become preponderant. The role of light requirements and their variation with age in the succession are discussed.

1610. Matuszkiewicz, W., and Matuszkiewicz, A. Pflanzensoziologische Untersuchungen der Waldgesellschaften des Riesengebirges. **[Plant-sociological investigations into the forest communities of the Riesengebirge.]** *Acta Soc. Bot. Polon.* 29 (3), 1960 (499–530 + 3 tbls.). 37 refs. [G.g.] O.B.D.

A revision is made, in the light of modern knowledge, of the vegetation types of the Riesengebirge, and 20 plant communities belonging to 7 associations are described. The Spruce forests of the lower montane areas, hitherto considered to be purely artificial, are now considered to be partly natural and locally conditioned permanent communities, forming an association, the systematic classification of which has yet to be determined. The forest communities of the Riesengebirge, except for the scrub communities, are more closely allied with those of the central European uplands, than with those of the W. Carpathians. Certain communities are present in specifically regional forms. The dependence of vegetation upon site factors was established, and for each site type the corresponding natural vegetation can be named. The altitudinal zones are considered to be the climax areas of certain associations. Climatically conditioned climax associations of the Riesengebirge are (1) at the lower levels the *Luzulo-Fagetum montanum*, (2) at the higher levels the *Piceetum hercynicum*, and (3) at the subalpine elfin woodland levels the *Pinetum mughi sudeticum*.

1611. **[Forest typology.]** *Sborn. věd. Prací Fak. Lesn. Čes. Vysoké Učení Tech.* No. 2, 1959 (1–96, 162–214). Many refs. [Cz.russ. & g.e. or f.]

A collection of 9 papers: Soil classification as a basis for determining forest types in the Kostelec nad Černými Lesy region (*V. Svoboda*); Soil zoology and its use in forest typology (*J. Vaněk*); The importance of fungi in forest typology (*A. Příhoda*); Raising forest stands according to forest types (*V. Císař*); The development and character of natural forest stands in the Křivoklát region (*J. Žák, B. Stone*); Evaluation of forest site fertility according to typological data (*V. Císař*); Forest-typological bases for growing Spruce in hilly country (*V. Samek*); Forest protection and forest typology (*M. Stolina, E. Nováková*); Forest typology and its tasks in solving current problems in Czechoslovakian forestry (*B. Rychlý*).

1612. Prudič, Z. Nástin ekologických poměrů v severovýchodní části Bílých Karpat. **[Ecological conditions in the N.E. part of the White Carpathians.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (6), 1960 (419–34). 10 refs. [Cz.cz.russ.g.]

Distribution and characteristics of the 8 forest types in the area, soils, climate, effect of human intervention etc.

1613. Samek, V. Lesy středního Povltaví. Část II. **[Forests of the Central Vltava region. Part II.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (89–140 + 3 tbls.). 48 refs. [Cz.russ.g.]

[Cf. *F.A.* 20 No. 292.] A typological study of another part of the region. Seven forest communities are distinguished and described.

1614. Mráz, K. Rostlinná společenstva lesů dolního Posázaví. **[Plant communities of the forests of the lower Sázava.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 19, 1960 (209–84). 65 refs. [Cz.cz.russ.g.]

Distinguishes and describes eight main communities. Those of the *Luzulo-Fagion* occupy most of the area.

1615. Pitko, J. Výskyt tisu (*Taxus baccata* L.) v lesných typoch harmaneckej oblasti. **[*T. baccata* in the forest types of the Harmanec region.]** *Lesn. Čas.* 6 (5), 1960 (340–52). 8 refs. [Slovak.slovak. russ.g.]

In this region of Central Slovakia, Yew occurs mainly in the *Fagetum dealpinum*, *F. pauper*, and *Tilieto-Aceretum*, on grey rendzinas. The Yew is found mostly on the driest, flattest sites, but game damage to natural regeneration is great, and though protective measures were introduced as long ago as 1803, more effective protection is now deemed necessary to preserve the species in this locality, the largest Yew area in Europe.

1616. Tregubov, V. ***Abieti-Fagetum.*** *Abstr. in Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (402–3). [F.] O.B.D.

A review of published information on the *Abieti-Fagetum* of central Europe has led to the following conclusions. The *Abieti-Fagetum* is a group of climax associations, having no exclusively characteristic species, but a characteristic combination of species. The associations are geographical and are characterized by indigenous species. The *Abieti-Fagetum dinaricum* is to be found at the centre of the area occupied by the *Abieti-Fagetum*, a region which, never having been occupied by glaciers, is rich in indigenous species.

1617. Gajić, M. R. Sadašnja i nekadašnja staništa bukovo-jelovih šuma (*Abieto-Fagetum* Jov.) u Šumadiji. **[Present and former stations of Beech/Fir forest (*Abieto-Fagetum*) in Šumadija.]** *Šumarstvo* 13 (1/2), 1960 (65–70). 18 refs. [Serb.f.]

Though mixed Beech/Fir forest is now found only on the Gledićske range, pollen analysis and study of the existing flora suggest that Fir (and other conifers) once grew with the Beech on the Kotlenik, Rudnik, and Ješevac ranges. As indicators of conifers, *Acer heldreichii*, *Gentiana asclepiadea* and *Prenanthes purpurea* were used. Conditions on other ranges in Šumadija do not appear to have been suitable for mixed forest.

1618. Fukarek, P., and Stefanović, V. Prašuma Perućica i njena vegetacija (prvi prilog). **[The virgin forest of Perućica and its vegetation (first contribution).]** *Rad. Poljoprivred.-Šum. Fak., Sarajevo* (*Šum.*) 3*B* (3), 1958 (93–146). 29 refs. [Croat.g.]

A detailed phytosociological study of this virgin forest area N. of Mt. Maglić, S. Bosnia, introduced by data on climate and geology and a review of previous work. Associations described include *Querceto-Carpinetum*, *Fagetum illyricum montanum*, *Abieto-Fagetum illyricum*, *Acereto-Fagetum*, *Acereto-Fraxinetum*, *Ostryeto-Ornetum*, *Piceetum excelsae illyricum*, *Pinetum mughi illyricum*, and certain successions, particularly after fire.

1619. Stefanović, V. Zajednica bijelog bora (*Pinetum silvestris dinaricum* prov.) i neke njene karakteristike na području Zapadne Bosne. [**The *Pinus sylvestris* association (*Pinetum sylvestris dinaricum* prov.) and its characteristics in West Bosnia.**] *Rad. Poljoprivred.-Šum. Fak., Sarajevo (Šum.)* 3*B* (3), 1958 (201–19). 28 refs. [Croat.g.]

Describes the ecology, floristic composition, and systematic position of this association, in which two subassociations are distinguished, *ericetosum* and *herbosum*.

1620. Čolić, D., and Gigov, A. Asocijacija sa Pančićevom omorikom (*Picea omorika* Panč.) na močvarnom staništu. [**An association with *P. omorika* on a swampy site.**] *Posebna Izd. Biol. Inst. N. R. Srbije* No. 5, 1958. pp. 131. 5 pp. of refs. [Serb.serb.e.russ.*e.russ.*]

A study of the association at Crveni Potok, an area on the right bank of the river Drina, near Mt. Tara, with an unusually diverse flora and fauna. Favourable conditions have allowed the survival of relict plant species (particularly *P. omorika*, normally found on elevated karst sites rather than on deep swampy soils) and much of the structure and character of former Tertiary forest. Climate, topography, soil, past exploitation of the area's forests, fauna, composition and structure of the present phytocoenosis, and data on the history of the vegetation of the site are discussed in detail. The association is named *Omorikae Piceeto-Alnetum glutinosae*.

1621. Sante, B. Il pino loricato (*Pinus heldreichii* Christ., var. *leucodermis* Ant.) in Calabria e sua possibilità di diffusione. [***P. leucodermis* in Calabria and the possibility of extending its range.**] *Ital. for. mont.* 15 (4), 1960 (157–63). [It.it.f.]

Describes the existing *P. leucodermis* forests in Calabria, particularly on calcareous soils, in some of which this species grows vigorously and regenerates naturally. Experiments are now being made in artificial regeneration, with a view to using it for the afforestation of the calcareous dolomite soils of S. Italy.

1622. Gupta, R. K. **On a botanical trip to the source of the river Ganga in Tehri Garhwal Himalayas.** *Indian For.* 86 (9), 1960 (547–52 + 6 photos, 1 map). 11 refs.

The main vegetation types observed were (1) tropical winter-deciduous forests, (2) *Pinus roxburghii* forests, (3) *Cupressus torulosa* and *Cedrus deodara*, (4) *C. deodara* forests on flood-plain deposits, (5) sub-alpine forests of *Betula utilis*, and (6) alpine pastures. It is concluded that the dominant conifers have ousted the Oaks which would be the natural climax vegetation, owing to intense grazing and cultivation.

1623. Maheshwari, J. K. **The vegetation of Asirgarh hills (Madhya Pradesh).** *Indian For.* 86 (9), 1960 (553–8). 2 refs.

Lists 145 species of trees, shrubs, and climbers. The forest vegetation is of the dry deciduous type, and generally a tropical thorn forest. In areas protected from, or inaccessible to, human interference and grazing, mixed *Boswellia serrata*/*Hardwickia binata* forest occurs. Much forest has been destroyed and in some places the hills are almost denuded of vegetation.

1624. Jain, S. K., and Kotwal, N. N. **On the vegetation of Shahabad in Rajasthan.** *Indian For.* 86 (10), 1960 (602–8). 6 refs.

Observations on flora and vegetation of eastern Rajasthan, for which no comprehensive flora has so far been compiled.

1625. Bégué, L. **Notes on some South Indian forest types.** *Indian For.* 86 (11), 1960 (680–3). 6 refs.

A translation of part of an article published in *Bois For. Trop.* [see *F.A.* 21 No. 4200].

1626. Letouzey, R. La forêt à *Lophira alata* Banks du littoral camerounais: hypothèses sur ses origines possibles. [**The *L. alata* forest of the Cameroons coast: hypotheses on its possible origins.**] *Bull. Inst. Centafr.* (*n.s.*) No. 19/20, 1960 (219–40). 23 refs. [F.]

A more detailed study, including a review of the relevant literature, of the question of the succession of *L. alata* in these forests, already treated by the author elsewhere [see *F.A.* 18 No. 3849], stressing the biotic factors involved, particularly the transition of the African population from a hunting to an agricultural stage of development.

1627. Langdale-Brown, I. **The vegetation of the Eastern Province of Uganda.** *Memoirs of the Research Division, Department of Agriculture, Entebbe* (*Series 2: Vegetation*) No. 1, 1959. pp. 154 + 7 maps and sheet of dgms. 70 refs.

This survey is concerned primarily with the savanna vegetation; 58 communities are distinguished and discussed, and their distribution is mapped on a scale of 1 : 500,000. *From author's summary.*

1628. **CSA meeting of specialists on open forests in tropical Africa, Ndola, Northern Rhodesia, 17–23 November 1959.** *Publication, Scientific Council for Africa South of the Sahara, London* No. 52, 1960. pp. 126. [E. or F.]

The following papers are included, in addition to the conclusions and recommendations of the conference: The utilisation of miombo timbers (*J. F. Hughes*); The enumeration of miombo woodland in Tanganyika (*M. S. Parry*); Yield regulation of *Pterocarpus angolensis* (*M. S. Parry*); Composition of the tropical dry forests of Nyasaland (*C. R. Hursh*); Floristic composition of miombo woodland (*D. B. Fanshawe*); Burning experiments in miombo woodland (*D. B. Fanshawe*); Utilisation of miombo species in Northern Rhodesia (*B. E. Webb*); Softwood afforestation in Copperbelt miombo woodland (*E. N. Cooling*); Fire protection in the Rhodesian Teak [*Baikiaea plurijuga*] forests of Northern Rhodesia (*D. G. Cumming*); Physiognomic, structural, and ecological definitions of woodland or open forest in Africa (*A. Aubréville*); Geographical distribution (*A. Aubréville*); The mine timbers of Haut Katanga (*J. Fouarge* and *A. Schmitz*); Silviculture and management of miombo woodland (*D. B. Fanshawe*); Steps towards the planned management of Northern Rhodesia's Western Province *Brachystegia* (*H. Lees*); Composition, classification, affinities and dynamism of stands (*P. Duvigneaud*); and Notes on plateau woodland soils in Northern Rhodesia (*T. M. Dow*).

1629. Welch, J. R. **Observations on deciduous woodland in the Eastern Province of Tanganyika.** *J. Ecol.* 48 (3), 1960 (557–73). 5 refs.

An analysis of the vegetation of an area of ca. 6 sq. miles N.E. of Kingolwira, Morogoro, covering topography, soils, climate, seasonal changes in vegetation, survey methods, and plant associes and succession, with particular emphasis on trees and other woody species. Woody, grass and herbaceous species are listed and referred to their associes.

1630. Loucks, O. L. **Environmental and phytosociological ordination of a regional forest vegetation.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (438–9). O.R.S.

A cool, humid region in N.W. New Brunswick supporting forests of Sugar Maple, Beech, and Yellow Birch on the hills, and Balsam Fir, White Spruce, Cedar, and Black Spruce on the slopes and valley bottoms, was selected for study. Detailed descriptions of the tree, sapling, shrub, and herbaceous vegetation, as well as of soil and physiography were obtained for 63 sample areas, selected randomly within broad strata. The vegetation record was used, with electronic-computer facilities, to calculate a matrix of indices expressing the similarity of each stand to all the others, and these values were used to construct a spatial arrangement or ordination of the samples, based on phytosociological features. An ordination technique based on the environmental data for each sample was developed. The stable features of the environment are considered in 3 groups, relating to moisture, nutrient supply, and local climate. Procedures for the synthesis of diverse types of measurement data into single expressions called scalars are described. Three major factors are considered in the synthetic moisture-regime scalar, 6 in the synthetic nutrient-regime scalar (*a*) and 4 in the synthetic local-climate-regime scalar. Distinct gradients in tree species composition are shown to correspond with the scalars. The relation of forest growth and species complexity to (*a*) is found to follow the sigmoid growth curve. Comparison of species distributions in the two ordinations demonstrates a marked degree of correspondence. The axes of the phytosociological ordination tend to form the diagonals of the environmental ordination. The primary factors influencing various portions of the phytosociological axes are determined by plotting them against the environmental scalars. Probability tests show that the scalar methods can be used reliably to predict the structure and composition of the forest communities on the undisturbed sites studied. It is concluded that the co-ordinate methods used here, with similar work from elsewhere, provide objective methods for rational qualification and subsequent classification of terrestrial ecosystems.

1631. Habeck, J. R. **A phytosociological study of the upland forest communities in the Central Wisconsin sand plain area.** *Transactions, Wisconsin Academy of Sciences, Arts and Letters, Madison* 48, 1959 (31–48). 11 refs. L.S.

Reports on a study in an ecotonal area between communities with prairie-like and northern Pine/hardwood-type understoreys, made in connexion with research on the winter range of white-tailed deer [cf. *F.A.* 21 Nos. 4186–7]. Sampling and classification methods are fully discussed. All forest communities were arranged by a "Presence Index", based on means of numbers of selected understorey species present, weighted by 1 for prairie species, 2 for dry boreal (Red and White Pine forest) and 3 for mesic (hardwood forest) species. The boreal types were further arranged by tree composition, on the basis of "importance values" combining values for relative density, relative dominance, and relative frequency. Both methods led to similar vegetational descriptions of the forests, which form a continuum with a progressively changing composition. Pure stands of Jack Pine, or Jack Pine/Scrub Oak comprised ca. $\frac{9}{10}$ of the area. The most mesic communities, which occur infrequently, are composed of White Pine, Red Oak, and Red Maple.

1632. Quarterman, E., and Keever, C. **Climax forest of the Longleaf Pine belt of the southeastern United States.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (315). O.B.D.

The seral position of hardwood stands on upland sites in this coastal plain belt has been in question. Phytosociological studies, in which widely distributed stands were sampled, have been made over a 3-year period. Soils from each of the sampled stands were also analysed mechanically and for major nutrients. These studies have established the continuity throughout the area of a mixed hardwood type of forest unified by certain binding species in a way similar to the various portions of the mixed mesophytic forest of Braun. Data obtained provide evidence for regarding this mixed hardwood type as the regional climax.

1633. Burk, C. J. **A floristic study of a sandhill area on the North Carolina coastal plain.** *J. Elisha Mitchell Sci. Soc.* 75 (2), 1959 (135–8). 10 refs. L.S.

The following plant communities were observed: (1) a xeric ridge community with *Pinus australis* [*P. palustris*] as the dominant tree species in association with *Quercus laevis* and *Aristida stricta*; (2) a pocosin community composed of elliptic-leaved evergreen Ericaceous species and Hollies, succeeded by members of the bay forest; (3) an ecotonal community composed of members of both the adjoining ridge and pocosin communities, as well as elements unique to the ecotone; and (4) disturbed communities of cut-over Pine forests, old fields and roadsides. *From author's summary.*

1634. Wells, P. V. **Physiognomic intergradation of vegetation on the Pine Valley Mountains in southwestern Utah.** *Ecology* 41 (3), 1960 (553–6). 8 refs.

The vegetation of the S.E. side of the Pine Valley

Mountains was sampled along a gradient ranging from 3000 to 6000 ft. Beginning from below, the following formations were found: Sonoran shrub (*Larrea/Franseria*); Mohavean shrub (*Coleogyne*); pygmy tree/chaparral; chaparral/deciduous woodland; *Pinus ponderosa* forest. Floristic gradients of a continuous nature were present throughout the transect, but no continuum was recognized among the physiognomically distinct formations. It appears that the width of the ecotone between two plant communities varies inversely with the differences in physiognomy and physiology that render them incompatible. *From author's summary.*

1635. WHITTAKER, R. H. **Vegetation of the Siskiyou Mountains, Oregon and California.** *Ecol. Monogr.* 30 (3), 1960 (279–338). 259 refs.

A detailed analysis of a rather complicated pattern of vegetation, in which mixed evergreen forests of conifers and sclerophylls are the prevailing climax type. The concept of the community gradient or "coenocline" in relation to the topographic moisture gradient is central to the author's treatment of the subject, and is expounded in detail.

1636. VECHTEN, G. W. VAN, III. **The ecology of the timberline and alpine vegetation of the Three Sisters, Oregon.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (440). O.R.S.

The study area, three 10,000-ft. volcanic peaks in the central Oregon Cascades, was divided into 6 zones, based primarily on physiography, and the vegetation of each zone is described. The large moraines and outwash that now cover much of the slopes, and the large areas covered by cinders, pumice and lava, combined with climatic factors, are holding the vegetation in a number of climaxes. There is evidence of climatic fluctuations within the last 200 years. As a result of a decrease in mean snowbank size, the Hemlock forest is advancing slowly into meadows and some other areas. The timberline is at ca. 6000 ft. and a number of factors are responsible for its limits. The tree line is ca. 1000 ft. higher and a different set of factors limits the trees.

1637. LOVELESS, A. R. **The vegetation of Antigua, West Indies, based largely on field work done by H. E. Box and the late C. F. Charter during the years 1932 to 1938.** *J. Ecol.* 48 (3), 1960 (495–527). 23 refs.

Discusses the environment of Antigua, and describes and identifies its chief plant communities under the heads: Seasonal formations; Dry evergreen formations; Edaphic formations; Biotic communities.

1638. LAMB, F. B. **The coastal swamp forests of Nariño, Colombia.** *Carib. For.* 20 (3/4), 1959 (79–89). 12 refs.

Describes, from observations made during a timber survey in the Tumaco region, the main forest types, their soils, water conditions, succession and economic importance. These include Mangroves, closed forests of fairly simple composition dominated by Sajo (*Campnosperma panamensis*), Nato (*Mora megistosperma* or possibly *M. oleifera*) or Cuangare (*Iryanthera juruensis*), and multi-species tropical moist upland forest. *I. juruensis*, which forms fairly uniform, closed single-canopied stands 90–100 ft. high, producing up to 25,000 bd. ft./acre in stems up to 50 in. d.b.h. and 50 ft. clear, is the most important species. It is exploited for veneer and structural timber for both home and export markets. Extraction is by barges equipped with double-drum winches to drag the logs out.

1639. GILLILAND, H. B. **A coniferous forest in Borneo.** *Malay. Forester* 23 (3), 1960 (217–20). 2 refs.

Analyses the composition of forest dominated by *Agathis alba*, on a raised beach in Brunei. *Podocarpus polystachyus* was prominent in the shrub layer and *Gnetum leptostachyum* var. *robustum* among the climbers.

1640. MOORE, R. M. **Sub-alpine treeless grasslands in southeastern Australia.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (268). O.B.D.

The tree line on Mt. Kosciusko is at ca. 6600 ft., but treeless areas, varying from several to >100 acres, occur at ca. 4000 ft., and some even at altitudes <2000 ft. The grasslands at 4000 ft. occupy the floors of shallow valleys, the sides of which are covered with *Eucalyptus pauciflora*. A study was made of factors governing the absence of trees on the valley floors. Records over a 2-year period showed that temperatures <18° F. were frequent below the tree line and could occur during any month of the year. Above the tree line such low temperatures were absent or rare. The unsuitability of the grassland environment for trees was confirmed by experimental plantings, and the sensitivity of young *E. pauciflora* to temperatures <18° was established experimentally in a cold box. An explanation is given of the opposing effects of topography and mature tree cover on the micro-environment of young trees.

2. SILVICULTURE

See also Nos. 1494, 1499, 1502, 1506, 1628.

1641. FISCHER, W. Erfahrungen und Probleme der Mechanisierung in der Europäischen Waldwirtschaft. [**Mechanization in European forestry.**] *Schweiz. Z. Forstw.* 111 (9/10), 1960 (471–8). [G.f.]

Reports on an FAO study tour in Baden-Württemberg, covering soil cultivation and fertilizing, seed extraction and nurseries, tending, logging, protection, roads, and the training of forest workers in new techniques, and discussing the extent of mechanization in various countries and its varying effect on silviculture. In Sweden, and partly also in Germany, large clear fellings have been favoured;

in Austria, less clear felling and more intensive silviculture; in Switzerland, the traditional selection and *Femelschlag* systems have not been affected.

1642. **[Management and utilization of Spruce in Canada.]** *For. Chron.* 36 (2), 1960 (126–65).

This issue includes a number of papers presented for discussion at the 1959 annual meeting of the Canadian Institute of Forestry: The utilization of Spruce in Canada (*R. W. Wellwood*; 23 refs.); Management planning in regard to Spruce (*C. Jorgensen*); Cutting practices in Spruce silvicultural management in Eastern Canada (*R. S. Johnson*; 17 refs.); Cutting practices in Western Spruce forests (*J. D. Clark*); Reforestation problems in Western Spruce forests (*G. Silburn*); Reforestation problems in Eastern Spruce forests (*E. Bonner*); Spruce silvicultural management for the future (*A. Moss*); Spruce management for the future (*A. L. K. Switzer*).

1643. Scholz, H. F. **Present status of Oak management in Wisconsin.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (649–60). 32 refs. O.R.E.

Reviews the kind and amount of regeneration, the effect of aspect and topography on regeneration, competition, sowings and plantings, and experimental fellings. [Cf. *F.A.* 19 No. 1584.]

1644. Vanselow, K. Die Waldbautechnik der Eiche im bayerischen Spessart in geschichtlicher Betrachtung. **[The silviculture of Oak in the Spessart region of Bavaria. A historical survey.]** *Forstwiss. Cbl.* 79 (9/10), 1960 (270–86). 2 refs. [G.]

Covers chiefly the period from 1550 to the present.

1645. Chylak, R. Hrast—pastorče bosanskog šumarstva. **[Oak—neglected child of Bosnian forestry.]** *Nar. Šumar, Sarajevo* 13 (5/6), 1959 (229–40). [Croat.g.]

Discusses the present status and value of Oak (*Quercus robur* and *Q. sessiliflora*) forests in Bosnia, their poor condition, and measures for improving them.

1646. Wadsworth, F. H. **Growth and regeneration of White Mangrove [*Laguncularia racemosa*] in Puerto Rico.** *Carib. For.* 20 (3/4), 1960 (59–71). 10 refs.

Describes stands on two typical sites, and trials with thinning and clear felling. Removing $\frac{1}{3}$–$\frac{1}{2}$ of original b.a. increased mean d.b.h. increment over the next 3–4 years in a very dense (>13,000 stems/acre) 10-ft.-high young sapling stand (0·04 vs. 0·07 in.), in a 30-ft.-high sapling stand (0·1 vs. 0·3 in.), and in a 22-year-pole stand with a 65 ft. canopy and a mean d.b.h. of 5 in. (0·11 vs. 0·22); in the pole stand it also increased volume increment. Growth of interspersed *Avicennia germinans* was similar to that of *L. racemosa*. No serious wind losses ensued, but natural regeneration was negligible. On narrow, clear-felled strips, however, regeneration was adequate and after 9 years had reached a height of 35 ft. and a b.a. of 115 sq. ft./acre. At that time 60% of stems were coppice, but the existing seedlings appeared to grow increasingly faster in diameter than the coppice. There was evidence of water-borne seed having germinated.

1647. Iyppu, A. I. **The silviculture and management of evergreen forests of Kerala State.** *Indian For.* 86 (9), 1960 (509–19). 16 refs.

Includes notes on current and future research.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 1320, 1322, 1341, 1646, 1658, 1660–8, 2248–9.

1648. Vorreith, M. Die forstliche Bewirtschaftung der Hochlagen, einschliesslich der Kampfzone des Waldes, in den österreichischen Alpen. **[Forest management at high altitudes, including the forest-limit ecotone, in the Austrian Alps.]** *Allg. Forstztg.* 71 (21/22), 1960 (237–41). [G.]

Argues, with illustrations, that not only clear fellings but also the legally prescribed selection fellings, often lead to forest destruction through snow breakage etc., and do not result in natural regeneration. A ban on fellings would not prevent the process but would considerably retard it, and if, along with the ban, dead and fallen trees were removed, opportunities for natural regeneration would be created. The need for avalanche control is stressed [cf. *F.A.* 19 No. 3099].

1649. Barrett, J. W. **Intensive control in logging Ponderosa Pine.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (603–8). 3 refs. O.R.E.

Describes an example of intensive control in clear felling. It is thought that, until the regeneration problem is solved, intensive logging control may offer the best approach to maintaining adequate growing stock in mature and overmature Ponderosa Pine stands in Central Oregon.

1650. Efimov, N. G. Gruppovo-vyboročnye rubki sposobstvujut sohraneniju podrosta. **[Group-selection fellings help to preserve advance growth.]** *Lesn. Hoz.* 12 (9), 1960 (19–22). [Russ.]

An account of microclimatic conditions in the openings made by group-selection fellings in an Oak/Ash/*Aegopodium*/*Carex* stand 220 years old in the Tellerman forest. Conditions in the openings are favourable for Oak advance growth, and group-selection is the best management system for these Oak forests of the central forest-steppe zone.

1651. Borsos, Z. A szálalógazdálkodás lehetőségei tölgyeseinkben. **[Possibilities of applying the selection system in Hungarian Oak woods.]** *Erdő* 7 (4), 1958 (121–33). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (9). [E.] C.G.B.

The selection system is to date only experimental in Hungary, but it is intended to apply it to 133 ha. of the Sarvar State Forest Enterprise, with the prime object of reducing the excessive Hornbeam and converting to Oak/Beech/Hornbeam of the *Asperula odorata* type. Cautious fellings and underplanting with Beech to form a group mixture of the 3 species is suggested as the method of conversion.

1652. Baskerville, G. L. **Conversion to periodic selection management in a Fir, Spruce and Birch forest.** *Tech. Note For. Br. Can.* No. 86, 1960. pp. 19. 5 refs.

An 83-acre, Fir/Spruce/Birch forest in N.W. New Brunswick is being converted from a patchy, several-aged condition to a periodic selection system of management. The first felling was made in 1947 and the second in 1956, to remove a total of 1528 cu. ft. of merchantable softwood per acre. Net growth, from 1947 after cutting to 1956 before cutting, was 27 cu. ft./acre of merchantable softwood p.a. Some 39 cu. ft./acre p.a. was lost by mortality, mostly by windthrow of decadent Fir. Comparison of the present stand structure with that of theoretical selection indicates a rapid approach to the latter. *From author's summary.*

222. Coppice, Pollarding and Lopping Systems

1653. Lengyel, S. A vadon előforduló sajmeggy hasznossága eredményes nevelése és felkarolásának gazdasági jelentősége. **[The usefulness and successful raising of *Prunus mahaleb* and the commercial importance of encouraging it.]** *Erdő* 6 (9), 1957 (353–6). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (1), 1958 (12). [E.] C.G.B.

By conversion of natural stands, *P. mahaleb* can be made to yield 16–20 thousand running m. in sticks and ca. 170 kg./ha. of fruit, valued at 37,000–46,000 Forints. All trees and saplings are cut back in winter along with other species. From the 3rd year, ⅓ of the luxuriant coppice shoots should be exploited annually, the thickest shoot on the stump being pollarded to provide a broad fruit-bearing crown.

1654. Jančík, A. Dynamika zastoupení dřevin "Ždánského lesa". **[Changes in species representation in the "Ždánský les".]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 6 (6), 1960 (471–94). 17 refs. [Cz.cz. russ.g.]

Evaluates the long-term effects of management in the coppice forests (since 1840), and their gradual conversion to high forest.

1655. Čížek, J. Možnosti usměrnění přírůstu lesní zásoby při přeměnách a převodech porostů. **[Possibilities of improving stand volume increment by conversion.]** *Sborn. věd. Prací Fak. Lesn. Čes. Vysokě Učení Tech.* No. 2, 1959 (147–61). 25 refs. [Cz.russ.g.]

A discussion of the possibilities of converting pure coniferous stands in Czechoslovakia, on the basis of site studies, forest typology, and improved management practices.

226. Changes of Silvicultural System. Conversion (by System or Species)

See Nos. 1651–2, 1654, 1805, 1843.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 1555, 1597–9, 1825, 2246.

1656. Leibundgut, H. **Purpose and methods in the analysis of the structure and increment of virgin forests.** *Transl. For. Prod. Lab. Can.* No. 57662, 1959. pp. 6. Limited distribution. Transl. from *Schweiz. Z. Forstw.* 110 (3), 1959. [See *F.A.* 20 No. 4375.]

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 1359, 1526, 1557, 1566 *et seq.*, 1591, 1646, 1648–50, 1700, 1710, 2066.

1657. Lehto, J. **Forest regeneration in Finland.** *Finn. Pap. Timb.* 10 (7), 1960 (90–2). [E.]

Discusses briefly the measures needed to ensure natural regeneration of Pine, Spruce and Birch, and conditions where artificial regeneration is necessary or preferable, and gives some figures for areas silviculturally treated since the 1920s.

1658. Bourgenot, L. Le traitement des sapinières de basse altitude du Jura. **[The management of *Abies alba* stands at low altitudes in the Jura.]** *Rev. for. franç.* 12 (11), 1960 (677–87). [F.]

The forest here studied (the communal forest of Clairvaux), like others of its kind, lies at the lower limit of *Abies alba* and the upper limit of the *Quercus* zone (mainly *Q. robur*, but with *Q. pubescens* on drier sites). It is concluded that the downward extension of the Fir took place during a recent relatively moist period, and that the dieback now of common occurrence is due for the most part to a series of droughts. Any selective treatment inevitably favours the return of broadleaved species, and the recommended treatment is clear felling on a relatively short rotation, preceded by thinning and seeding fellings to ensure advance reproduction, at a much earlier age than is used at higher altitudes.

1659. Graikiotis, P. La régénération naturelle des sapinières helléniques. **[Natural regeneration in the Fir forests of Greece.]** *Vegetatio* 9 (4/5), 1960 (328–38 + 6 photos). 18 refs. [F.] A.P.B.

Natural regeneration in the *Abies cephalonica* forests only takes place in specially favoured sites. Elsewhere, although the seeds germinate well, the seedlings die of drought after the beginning of August. The lack of water in the upper soil horizon, which is responsible, is partly due to soil degradation. However, where the soil has developed far enough for a *Hypnum cupressiforme* community to form, natural regeneration is assured, whatever the system applied. It is important to preserve this ground cover and the soil of the Fir stands in general, to which end the country's grazing practices should be reformed.

1660. Hatcher, R. J. **Development of Balsam Fir following a clear-cut in Quebec.** *Tech. Note For. Br. Can.* No. 87, 1960. pp. 21. 30 refs.

A study of stand development was begun in 1948 on an area of 5 sq. miles, clear felled for Fir and Spruce pulpwood between 1941 and 1944, in section B.1 of the Boreal Forest Region in Quebec. At the time of felling, 70% of the forest was classified as virgin and uneven-aged, 25% was of fire origin 80 years old, and 5% was of blow-down origin. Most of the Firs were between 60 and 90 years but the

Spruce were older, averaging ca. 100 years and ranging from 50 to 200. The forest contained 1900–3000 cu. ft./acre of Spruce and Fir, and 20–600 cu. ft. of White Birch. The 10-chain grid of semi-permanent $\frac{1}{10}$-acre line plots was remeasured in 1958, when a study was also made of the origin and height growth of the Fir. The forest recovered well from felling and now comprises fully stocked sapling stands, predominantly Fir with much reduced quantities of White Birch and White and Black Spruce. It is unlikely that Spruce will again form a proportion of the stand equal to that before felling. Fir reproduced by accumulating regeneration for many years under a crown canopy that prevented normal growth until the parent stand was clear felled; between 78 and 90% was <2 ft. tall at the time of felling. These small seedlings grew well after overcoming heavy competition from raspberry, the growth of individuals being related to their growing space and available light. Study of the origin of the forest suggests that regeneration might be adequate after clear felling 50- to 60-year-old stands. Valuable information would be forthcoming from studies made to determine the state of advance growth in 40- to 60-year-old stands and its development after clear felling. *From author's summary.*

1661. UTKIN, A. I. O estestvennom vozobnovlenii listvennicy daurskoj v central′noj Jakutii. **[The natural regeneration of *Larix gmelinii* in central Yakutia.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (44–68). 28 refs. [Russ.]

[Cf. *F.A.* 22 No. 335.] It was concluded from the present study that natural regeneration on clear fellings in the predominantly *Vaccinium*-type Larch forests of the drier parts of central Yakutia proceeds rather slowly because of sod formation. If Larch does not re-establish itself fairly quickly, because insufficient seed trees are left, the succession is: grassy vegetation → shrubs and *Betula platyphylla* → Larch; in this case the regeneration period of the Larch is 30–40 years. In most cases, however, no species succession occurs, the Larch regenerating immediately. Advance growth is important for reforestation only in the wetter regions. The Larch usually forms dense stands of self-sown trees on burns. The hare, *Lepus timidus*, causes extensive damage to leading shoots of young Larch during its periodic population peaks, and should be taken into account when planning regeneration.

1662. IZVEKOV, A. A. Lesovosstanovlenie na koncentrirovannyh lesosekah v el′nikah. **[Regeneration on concentrated fellings in Spruce forests.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (3–22). 27 refs. [Russ.]

From studies on clear fellings of various ages in several types of *Piceeta* in the Vologda region, determines the numbers of advance growth (a.g.) and of seedlings becoming established after the felling, and also the damage to a.g. caused by various methods of felling and skidding [cf. *F.A.* 22 No. 859]. It is concluded, *inter alia*, that every effort should be made to preserve a.g., that winch skidding does less damage to it than tractor skidding, and that a.g. growth ≯1·5 m. high is the most resistant to the change in microclimate after the felling. A scheme for cleaning up the felling site in the spring is presented, which takes into account the type of forest, the amount of a.g. surviving, and the skidding method (tree-length logs or whole trees).

1663. KASIMOV, V. D. Klassifikacija elovogo podrosta pod pologom lesa. **[Classification of Spruce advance growth.]** *Lesn. Hoz.* 12 (7), 1960 (9–11). [Russ.]

Distinguishes three categories of advance growth: (*A*) resistant (i.e. able to regenerate an area after clear felling of the parent stand); (*B*) less resistant; (*C*) unreliable. The diagnostic characters of each (age; height; stem, crown and foliage characters; height increment; recovery period after clear felling; distribution) are tabulated.

1664. NEMKY, E. Tölgyeseink természetes felújításának alapvetö kérdései. **[Basic problems of natural regeneration in Hungarian Oak forests.]** *Erdö* 6 (11), 1957 (407–15). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (10). [E.] C.G.B.

The acorns of *Q. pubescens* germinate first, then those of *Q. sessiliflora* and *Q. robur*, and last those of *Q. cerris* and *Q. borealis* var. *maxima*, which mature in 2 years and germinate in 6–8 weeks. Ground preparation and litter are important. Where regeneration is rich and uniform, a uniform opening of the canopy over a period of 3–6 years, and where it is in groups, group fellings over 12–16 years, are indicated. The order and direction of operations as affected by topography and forest type are tabulated.

1665. GAMMON, A. D., RUDOLPH, V. J., and AREND, J. L. **Regeneration following clearcutting of Oak during a seed year.** *J. For.* 58 (9), 1960 (711–5). 6 refs.

A 45-acre mixed hardwood stand in S. Michigan, consisting primarily of *Quercus rubra* and *Q. alba*, was clear felled in winter 1950–51 following a good acorn crop, and the resulting regeneration studied on 46 milliacre plots. Data are tabulated by species on the stocking, survival, and mean height of the regeneration 2, 3, 5 and 7 years after felling, and on number of stems per acre by height class in 1957. Sprouts decreased from <9% of all regeneration (the rest being seedlings) in 1952 to 3% in 1957, when *Q. rubra* sprouts were the most common (110/acre) but too poorly distributed for a future stand. In 1952, there were 13,900 seedlings/acre, including 830 *Q. rubra*, and in 1957, 8720 (of which 71% were survivors from 1952) including 710 *Q. rubra*. Rabbit browsing increased from 3% of all regeneration in 1952 to 36% in 1957, *Q. rubra* suffering severely. Clear felling did not result in adequate Oak regeneration; most important in the new stand were *Fraxinus americana*, *Acer saccharum*, *Ulmus americana*, *Prunus serotina*, and *A. rubrum*, in that order. Measures suggested to favour Oak include early clearing and rabbit control. [Cf. *F.A.* 19 No. 1584.]

1666. HALL, M. J. **The effects of stocking density on seed production in some Eucalypts. [With**

discussion.] *APPITA, Melbourne* 14 (1), 1960 (48–56). 9 refs.

Because of the high cost of artificially establishing Eucalypts, it is essential that forest areas, as far as possible, be regenerated naturally. Seed and seedling losses in Eucalypt forests are considerable. Generally, seed production increases with the age of the trees and the size of the crowns. In this study, 40- to 60-year-old pole-sized Eucalypts of various species and growing at different stocking densities have been felled and the seed collected, extracted and tested. Results are only tentative, because of the variability between trees, and the limited information, which was restricted to one year's sampling. It was found that seed supply is the limiting factor for *Eucalyptus obliqua* and *E. goniocalyx* at stocking densities >80 and 130 sq. ft. b.a. per acre respectively. *E. sieberiana* appears to carry sufficient seed in all but the most densely stocked stands. Some evidence shows that *E. scabra* is similar to *E. obliqua* but that *E. muelleriana* rarely carries sufficient seed at any stocking density. Where seed supply is the limiting factor, partial cutting of the stand appears to offer the best solution, so that residual trees can develop a seed crop before final felling. *From author's summary.*

1667. CUNNINGHAM, T. M. **The natural regeneration of *Eucalyptus regnans*.** *Bull. Sch. For. Univ. Melbourne* No. 1, 1960. pp. xi + 158, 11 plates. 63 refs. Price 25*s*.

The main factors influencing the regeneration of *E. regnans* forests in Victoria and Tasmania, in association with their utilization, are studied in detail under the following main chapter heads: (1) The *E. regnans* forests, their distribution and the regeneration problem [cf. *F.A.* 20 No. 2912]; (2) Description of intensive-study areas; (3) Seed production and seed shed [cf. *F.A.* 19 No. 1501]; (4) The fate of the dispersed seed; (5) Laboratory studies of factors affecting germination and their relation to field conditions [cf. *F.A.* 19 No. 1645]; (6) Germination in the field, and plot studies; (7) Seedling survival, covering (8) the factors affecting seedling survival in general, (9) winter losses, including losses due to fungi and the effect of reduced light intensity, and (10) the effect on seedling establishment of browsing by wild animals and of competing vegetation after logging; (11) Pre-logging seedbed preparation; (12) Partial cutting to obtain regeneration; and (13) Summary of the factors controlling regeneration, and discussion of the silvicultural techniques considered as suitable modifications applicable to the present basic seed-tree system. [Cf. *F.A.* 21 Nos. 1964–5.]

1668. CREMER, K. W. **Problems of Eucalypt regeneration in the Florentine Valley [Tasmania]. With discussion.** *APPITA, Melbourne* 14 (2), 1960 (71–8). 1 ref.

The paper deals only with *Eucalyptus regnans*, and with the special regeneration problems arising mainly from the presence of a dense understorey of temperate rain forest or wet sclerophyll scrub, and from the high light requirements of the Eucalypts. These problems are: the timing of the regeneration burn, timing of seed-tree removal, and supplementary action, e.g. protection against browsing. [Cf. *F.A.* 21 No. 320.]

1669. SETH, S. K., and BHATNAGAR, H. P. **Indicator species for Sal (*Shorea robusta*) natural regeneration.** *Indian For.* 86 (9), 1960 (520–30). 7 refs.

The most reliable indicators are to be found in the shrub and herb layer. Tree species, especially the top-canopy ones, are more characteristic of the forest type, and are not sensitive enough for accurate diagnosis of ground conditions relative to regeneration. The lower-storey species are of more value, but the shrub and herb layer is of much greater importance. The most reliable indicators of favourable conditions are *Clerodendrum infortunatum* and *Moghania chappar*. *Saccharum spontaneum* is always a strong contra-indication.

1670. LANCASTER, P. C. **Investigation into natural regeneration in tropical high forest in southern Nigeria.** *Niger. For. Inform. Bull.* No. 2, 1960. pp. 22.

Presents an interim report, after 5 years, on the effect of various pre-exploitation combinations of climber cutting, cleaning, and opening the canopy by poisoning, on regeneration. Concludes that where seed-trees are present, all the combinations will give a reasonable amount of regeneration.

1671. LANCASTER, P. C. **Investigations into methods of obtaining and encouraging the growth of natural regeneration after exploitation in tropical high forest in southern Nigeria.** *Niger. For. Inform. Bull.* No. 8, 1960. pp. 21.

An interim report on the effect of post-exploitation regeneration operations (climber cutting and poisoning of unwanted trees) on regeneration in lowland rain forest; further development will be studied for many years.

1672. MAGER, H. Erfahrungen bei der Bodenbearbeitung im Buchenmastjahr 1958. **[Soil cultivation [for natural Beech regeneration] in the mast year 1958.]** *Forsttech. Inform., Mainz* 1960 (10), (73–6). 1 ref. [G.]

Good results were obtained with a Ferguson spring-tine cultivator in weed-infested Beech stands near Wiesbaden, save on very heavy or very shallow soils (a rotary cultivator proved efficient on the latter). Except where weeds were very heavy, cultivation could be done even during or after seedfall. Costs were DM 48/ha. for one, and DM 85 for the two treatments generally necessary.

232. Artificial Regeneration

See also Nos. 1503, 1657, 1828, 2646.

1673. Memoria 1959. **[Report [on Poplars] for 1959.]** *Mem. Com. Nac. Chopo, Madrid* 1959. pp. 81. [Span.]

Reviews the year's activities for 1959, and includes appendices giving the text of a report to the International Poplar Commission, reports on trial plots in 3 different provinces, results obtained with experimental clones in León Forest District, and the present situation and outlook in 7 Spanish provinces.

1674. Memoria 1959. **[Report [on Eucalypts] for 1959.]** *Mem. Com. Nac. Eucalipto, Madrid* 1959. pp. 55. 5 refs. [Span.]

Reports on the year's activities of the Commission, and includes appendices giving the text of reports to FAO and IUFRO, also summaries of the present situation and future outlook in 3 Spanish provinces [cf. *F.A.* 21 No. 4251].

1675. Biraud, J., and Catinot, R. Les plantations artificielles d'okoumé au Gabon. **[Artificial plantations of *Aucoumea klaineana* in Gabon.]** *Bois For. Trop.* No. 73, 1960 (3–23). [F.e.span.]

Research and trial plantings have been carried out since 1935, and a satisfactory technique has been evolved. Planting is now being done at a rate of 1300 ha./year. After reviewing the history of this research, the author describes the technique in current use, with detailed schedules of work month by month for the year before planting, up to and including the third year after it, when the first thinning is carried out.

1676. Kanjanapandh, P. **[Advice on the formation of *Rhizophora* plantations.]** *Vanasarn* 18 (2), 1960 (47–52). [Siam.e.]

Briefly describes the habitat and distribution of the various genera of Mangrove in Siam and, with particular reference to *Rhizophora*, gives notes on artificial regeneration (by seed), silviculture and management, stressing the advantages of short (10- to 12-year) rotations.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 1621, 1794–5, 1803, 1955.

1677. Kukol', L., and Hojnoš, J. Budeme aj u nás pestovať ginkgo? **[The possibility of growing *Ginkgo biloba* in Slovakia.]** *Lesn. Čas.* 6 (5), 1960 (353–65). 10 refs. [Slovak.russ.g.]

Discusses the features of the species which make it interesting for possible planting in Slovakia. Its diameter increment is 18% above that of Silver Fir, and 35% above that of Norway Spruce growing under the same conditions. Ginkgo litter contains more Ca, Mg and K than that of Beech and conifers, and its aqueous extract is less acid than that of Spruce, Oak and Beech litter. It is thought that Ginkgo might be a useful site-improving species for neutralizing soils that are too acid.

1678. Zajcev, B. D. Počvy i proizvoditel′nost′ nasaždenij. **[Soils and stand yield.]** *Lesn. Hoz.* 12 (10), 1960 (16–8). [Russ.]

Presents the results of investigations on the nutrient status of several soils, and on plantation yields, for the mixed forest zone of European Russia. On this basis, constructs a table showing species and establishment techniques recommended for planting (1) podzolic soils (comprising (*a*) sands, (*b*) sandy loams and light clay-loams, (*c*) medium and heavy clay-loams, and clays); (2) podzolic-boggy soils (comprising (*a*), (*b*) and (*c*)); and (3) boggy soils (comprising (*d*) raised bogs, (*e*) transitional bogs, (*f*) fens). Scots Pine is recommended for all sites; Larch for (1*b*) and (1*c*); Spruce and Oak for (1*c*), (2*c*) and (3*f*).

1679. Lesovody rekomendujut cennye porody. **[Foresters recommend valuable species.]** *Lesn. Hoz.* 12 (10), 1960 (49–51). [Russ.]

Collected summaries of papers contributed by several authors, recommending valuable species (including exotics) as timber and decorative trees for various parts of the U.S.S.R., sometimes on the basis of trials. The proposals are: *Juglans nigra* in the N. central forest-steppe zone; *Pseudotsuga taxifolia* in Belorussia; *Gymnocladus dioicus* in S. Russia, the Crimea, etc.; *Sorbus torminalis* in the Caucasus; *Corylus avellana* in E. Russia, the Trans-Volga region and the S. Urals; *Tilia cordata* in W. Siberia; *Juglans mandshurica* for many regions besides the Far East; *Maackia amurensis* in central European Russia; *Crataegus pontica* in Soviet Central Asia and S. Kazakhstan; *Buxus hyrcana* in Azerbaijan.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 1828, 1846, 1862–3, 1883.

1680. Jackson, J. K. **The introduction of exotic trees into the Sudan.** *Sudan Silva* 10 (1), 1960 (14–30).

Notes on *Acacia mollissima* [*A. mearnsii*], *Azadirachta indica*, *Bambusa vulgaris*, *Callitris calcarata*, *Cassia siamea*, *Cedrela toona*, *Cupressus lusitanica*, *Dalbergia sissoo*, *Eucalyptus* spp., *Gmelina arborea*, *Pinus patula*, *P. radiata*, *Prosopis juliflora*, and *Tectona grandis*.

1681. Leuchars, D. **Latin American conifers in Uganda.** *Tech. Note For. Dep. Uganda* No. 87 (60), 1960. pp. 11. 10 refs.

Deals with ecology, acclimatization, silviculture, protection, and utilization of *Cupressus lindleyi*, *C. benthamii*, *Pinus caribaea*, *P. patula*, *P. montezumae*, *P. pseudostrobus*, *P. ayacahuite*, *P. engelmannii*, *P. douglasiana*, *P. michoacana*, *P. oocarpa*, and *Abies religiosa*.

1682. Delvaux, J. Considérations anticipées sur le traitement des peuplements de pins tropicaux. **[Proleptic considerations on the treatment of Pines in the tropics.]** *Bull. Soc. For. Belg.* 67 (8/9), 1960 (293–303). [F.]

On the basis of experience with exotic Pines in Haut-Katanga [cf. *F.A.* 21 No. 2982] the author makes tentative recommendations for the management of similar plantations in the tropics in general.

1683. Barrett, W. H. G. Los enebros cultivados en la Argentina. **[*Juniperus* spp. cultivated in Argentina.]** *Revista de Investigaciones Agrícolas, Buenos Aires* 13 (2), 1959 (207–24 + 4 plates). 20 refs. [Span.] C.G.B.

Presents descriptions of 17 species, with a key and notes on methods of raising young plants.

1684. Meyer, H. Die Omorikafichte—*Picea omorica* Pančić—eine Bereicherung unserer artenarmen Baumflora. **[The Serbian Spruce, *P. omorika*, a species to supplement the scanty tree flora of Germany.]** *Arch. Forstw.* 9 (7), 1960 (595–614). 28 refs. [G.g.russ.e.]

Reviews the literature and gives details of early planting in N. and Central Europe, nursery practice, and the growth of six 27- to 30-year plots in Saxony. Compared with that of *P. abies*, their early growth shows half a quality-class inferiority in height, no discernible difference in diameter, and much greater resistance to snow, ice, frost, and bark scaling by deer. These advantages and its apparent resistance to fumes suggest further trials. The tree is often despoiled for its ornamental branches; brashing a small area (1–2 green whorls/tree to facilitate calipering) brought a profit of DM 2100/h.a. from sales of the branches.

1685. NOŽIČKA, J. Snahy o zvýšení produktivity našich lesů pěstováním rychle rostoucích dřevin. **[Efforts to increase the productivity of Czechoslovakian forests by planting fast-growing trees.]** *Sborn. věd. Prací Fak. Lesn. Čes. Vysoké Učení Tech.* No. 2, 1959 (97–114). [Cz.russ.g.]

Surveys the history of the introduction of exotics (first Larch, and then Robinia, Sweet Chestnut, Weymouth Pine, Poplars, Douglas Fir, etc.) since the second half of the 18th century.

1686. FÉR, F. O japonském modřínu (*Larix leptolepis* Gord.) na Černokostelecku. **[Japanese Larch in the Kostelec nad Černými Lesy area.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (6), 1960 (455–70). 30 refs. [Cz.cz.russ.e.]

Compares growth rate, phenology, branching habit, cone size and shape, seed quality, and wood quality of *L. leptolepis* (43, 53, and a few 60 years old) with those of *L. decidua*. Insect and fungal pests of *L. leptolepis* in the area are also discussed. The possibilities are pointed out of growing *L. leptolepis* on some extreme sites, and also of its use in hybridization (with reference to the European literature on hybrids of the two species).

1687. SALIŅŠ, S. Lapegļu ieaudzēšanas rezultati Latvijas PSR. **[Trials of Larch in Latvia.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (193–221). 37 refs. [Latv.russ.] N.L.L.

Discusses the performance (increment, fruiting, pests, etc.) of *Larix decidua*, *L. sukaczewii*, *L. sibirica* and *L. leptolepis* over some years, and, very briefly, *L. kurilensis*, *L. gmelinii*, *L. laricina* and *L. principis-rupprechtii*.

1688. MARGUS, M. Murrei mänd Eestis. **[*Pinus contorta* var. *latifolia* in Estonia.]** *Loodusuur. Seltsi Aastar., Tallinn* No. 51, 1958 (1959), (43–60). 21 refs. [Est.russ.g.*russ.g*.] N.L.L.

A comparison of Lodgepole with Scots Pine, on the basis of data from sample plots in 24- to 33-year plantations. On *Vaccinium* sites, Lodgepole is as productive as, or better than, Scots Pine, and clearly does better on old arable land and on *Calluna* sites with hardpan. On moist *Myrtillus* sites, however, its productivity is less than that of Scots Pine; its productivity improves with drainage, and on well drained sites probably surpasses that of Scots Pine. Lodgepole is suitable for alvars. Self-pruning is not as good as in Scots Pine, but stem form is good. Plantations should be established with nursery plants 2–4 years old, at 1·5 × 1·5 to 2 × 2 m. spacing. Seed production is poor.

1689. RIBERS, U. Bör man odla ekskog fortfarande? **[Should one continue to grow Oak?]** *Skogen* 47 (22), 1960 (406–7). [Sw.]

Discusses operations in E. Götland in 1919–59 during which 52,900 plants of *Quercus robur* and 13,410 of *Q. borealis* were planted on good sandy mull soils. Generally *Q. borealis* has died but *Q. robur* is satisfactory. Oak is preferable to Spruce for sites with long grass or exposed to storms, and for reasons of amenity. The use of small wood for pulp may replace its former uses as fuel and for tanstuff.

1690. JÁRÓ, Z. A vöröstölgy növekedési viszonyai. **[The growth of Red Oaks.]** *Erdö* 6 (2), 1957 (63–7). [Hu.] From *abstr.* in *Hung. agric. Rev.* 6 (3), 1957 (7). [E.] C.G.B.

The hybridizing *Q. borealis*, its var. *maxima*, *Q. palustris*, and *Q. coccinea* have shown themselves, in Hungary, indifferent to air moisture, but sensitive to a dry acidic soil, lime in the top 60 cm. and even temporary flooding. They cannot in such situations replace the Turkey Oak. They are preferred for the rust-brown forest soils developed on sand (where valuable native Oaks do badly), not only for their fast growth and abundant litter but for their superior timber and tannin-containing bark.

1691. MATVEEV, P. N. Razvedenie topolej v tugajah. **[Cultivating Poplars in [Central Asian] riparian woodlands.]** *Lesn. Hoz.* 12 (9), 1960 (42–4). [Russ.]

Gives data on the height and diameter of 1-year and 8-year *Populus* × '*canadensis*', *P. nigra* var. *italica* and *P. tacamahaca* in the Ili valley (Alma-Ata region) on saline soils. *P. tacamahaca* has not done well; the other two species are thriving.

232.12. Races and Provenance Trials

See also section 165.3/.7.

1692. KIELLANDER, C. L. Svensk gran och kontinentgran. Förelöpande meddelande. **[Swedish Spruce and continental Spruce. A preliminary report.]** *Svenska SkogsvFören. Tidskr.* 58 (3), 1960 (193–204). 10 refs. [Sw.sw.g.]

Describes and discusses provenance trials at Ekered, Gettinge and Säfsnäs, situated respectively in climatic growth regions II, IV and V [of the Skogsvärderings-instruktion, 1951] using seed from 4–7 open-pollinated, average mother trees (not plus trees) in various parts of Sweden between Skåne and Dalarna, 6 of Swedish and 8 of continental provenance. Though the restricted scale (4 replications of 100 of each progeny), fewness of mother trees, and short duration of the trials preclude definite conclusions, mean heights measured at 12 years showed no general superiority of continental over Swedish provenances [cf. *F.A.* 13 No. 1121; 15 No. 2280]. The results suggest, however, that Swedish Spruce is less variable, and that the chances of finding exceptionally good provenances among continental Spruce are greater. Two of the latter showed promise.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.3/.7 and Nos. 1673, 1691, 2002.

1693. JOBLING, J. **Poplars and Elms.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (54–8).

Varietal trials of Poplars continue. On the most favourable sites, the most vigorous varieties have reached 50 ft. in height (62 ft. max.) in 8½ years, with girths of ca. 26 in. (29·5 in. max.), and standing volumes of ca. 750 Hoppus ft./acre (18 × 18 ft. spacing). Unfortunately the most vigorous variety, "Androscoggin", has been found to be susceptible to bacterial canker. The best age and type of planting material has been found to be 2-year rooted setts, and planting in holes made by explosives gave better growth after 4 years than in holes made by a post-hole borer or hand-dug. An intensive study has been started of the varieties of Elm in Britain, with a view to finding those that have the timber properties most favoured in the furniture trade, and at the same time good silvicultural characteristics.

1694. JANSON, L. Wzrost różnych form topoli w czteroletniej uprawie prowadzonej ekstensywnie. **[Growth of various forms of Poplar in four-year-old plantations run on extensive lines.]** *Sylwan* 104 (7), 1960 (79–86). [Pol.] (*Biul. Inst. Bad. Leśn.* No. 3, 1960.)

A report, essentially in terms of height growth, on many species and hybrids at Sękocin. Best were *Populus* × *regenerata* (from Kórnik) and *P.* × *robusta* (Gorstynin). The hybrids *P. nigra* var. *italica*) (Warsaw) × *P. serotina* (Warsaw), *P. nigra* (Parchatka) × *P. n.* var. *italica* (Warsaw), and *P. berolinensis* (Warsaw) × *P. nigra* (Parchatka) were also good.

1695. CRAM, W. H. **Performance of seventeen Poplar clones in South Central Saskatchewan.** *For. Chron.* 36 (3), 1960 (204–8, 224). 14 refs.

Survival of 17 Poplar clones, 6 years after planting in 1951, ranged from 0 to 100%. Total height of the 13 clones surviving in 1956 varied from 11 to 25 ft. FNS No. 44–52, a natural hybrid of *P. deltoides*, was the outstanding clone in the test, with a survival of 94% and height of 25 ft. Three clones, FNS No. 44–52, Saskatchewan, and BNW No. 4 demonstrated resistance to disease (*Cytospora* canker), while 10 clones proved highly susceptible. Survival and growth for FNS No. 44–52, 38P38, *P. tristis* No. 1 and *P.* × *gelrica* were superior to those of Northwest Poplar, which showed a survival of 75% and height of 18 ft. *From author's abstract.*

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 1361, 1377, 1774, 1789, 1794, 1799, 1988.

1696. APPLEQUIST, M. B. **Effects of cleared-and-burned hardwood slash on growth of planted Loblolly Pine in Livingston Parish, Louisiana.** *J. For.* 58 (11), 1960 (899–900). 1 ref.

At the end of the second and third growing season, seedlings planted where slash had been burnt in windrows had a highly significant height advantage over seedlings planted between windrows. No significant difference was found in survival or infection by *Cronartium fusiforme*. Soil analyses showed large increases in available P, Ca, K, and Mg under burnt windrows. The normally acid soils became slightly alkaline.

1697. HANBEKOV, I. I., and OLIFEROV, A. N. Dinamika vlažnosti počvy pri raznyh sposobah ee podgotovki pod lesnye kul′tury v gornyh uslovijah. **[Changes in soil moisture with various methods of soil preparation for plantations in mountainous regions.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (143–56). [Russ.russ.]

In the droughty montane parts of the Crimea, small (2 × 2 m.) patches proved unsuitable, as available soil moisture fell to, or almost to, zero. The best soil-moisture regime was obtained by complete tillage, or tillage in broad strips. From studies of the dynamics of soil moisture in various parts of terraced slopes, it is concluded that terracing improves the moisture regime on both N. and S. slopes.

1698. STRATONOVIČ, A. I. Metody iskusstvennogo vosstanovlenija taežnyh lesov Evropejskoj časti SSSR s primeneniem mehanizacii. **[Mechanized methods of artificial regeneration of taiga forests in European Russia.]** In *Voprosy lesovedenija i lesovodstva*. Moscow. 1960. pp. 185–97. [Russ. E.]

Discusses site types, preparation of the site for mechanized operations, establishment of artificial stands on very moist and on drained soils, and enrichment on old clear fellings where conifers have not re-established themselves.

1699. KURUŠIN, F. M., RUSANOV, S. G., and KORNIENKO, P. P. Mehanizacija lesovosstanovitel′nyh rabot na vyrubkah. **[Mechanization of regeneration measures on felled areas.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (206–29). [Russ.]

Discusses various types of Soviet disk and mouldboard ploughs, rotary cultivators, harrows, hand seed-drills, borers, root grubbers, stump removers, undergrowth cutters (saws), etc.

1700. Bodenbearbeitung. **[Soil cultivation.]** *Allg. Forstzeitschr.* 15 (42), 1960 (601–12). [G.]

A special number including: Mechanized road maintenance (*K. Schurr*); Mechanical soil cultivation (*W. Raiss*) [as an aid to natural regeneration, in strip ploughing, boring plant-holes, full cultivation, hoeing of plantations etc.]; and Plant-hole and soil borers for forestry (*G. Zimmermann*) [presenting data on 3 borers accessory to power saws, and 7 accessory to various tractors etc.].

1701. BALSAY, L. Vágásterületek gépesitett feltörése. **[Mechanized complete cultivation of felling areas.]** *Erdö* 6 (9), 1957 (321–7). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (1), 1958 (10). [E.] C.G.B.

For the intensive soil preparation required in regenerating badly managed or damaged stands, a small tractor-drawn plough is recommended on medium and heavy soils with stumps; on stump-free land, an Italian Martinelli-type trenching plough works well; on loose soils, the Russian PP-50 is best; for moorland and reedy ground, modified types of the Italian and Russian models will do.

1702. REDHEAD, J. F. **Taungya planting**. *Niger. For. Inform. Bull.* Nos. 4–7, 1960 (13–6).

Gives some data on the Iguomokhua taungya series (Sapoba forest reserve) including population supported, area required per rotation, and costs of establishment and production.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

1703. DALSKOV, F. Behandling af *Abies*-frø. **[Handling seed of *Abies* spp.]** *Dansk Skovforen. Tidsskr.* 45 (8), 1960 (331–8). [Dan.]

Discusses time and method of cone collection, cone storage, the extraction, storage and testing of seed, and sowing.

232.311. Seed Production (Seed-Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 1439, 1560, 1565–6, 1666, 1818, 1866.

1704. JAMES, G. A. **Seed production in a scrub stand**. *Tech. Note Alaska For. Res. Cent.* No. 43, 1959. pp. 3. 1 ref.

A preliminary study, in a scrub stand containing 73% *Thuja plicata* (by b.a.) and the remainder consisting of *Tsuga heterophylla* and *T. mertensiana* with an occasional Sitka Spruce, showed a high seed production, especially for *T. plicata*. The total production (46 lb./acre in a light-to-medium seed-year) compared favourably with that of 91 lb. from a climax stand in a good year.

1705. KUPRIONIS, J. Medžių sėklų derliaus pasikartojimai Lietuvos miškuose. **[Periodicity of seed crops in the forests of Lithuania.]** *Girios Aidas, Chicago* No. 17, 1959 (1–12 + 1 gph.). [Lith.e.]

Data are presented (with a graph) for Scots Pine, Spruce and Oak (*Quercus robur* and *Q. sessiliflora* together) for the period 1928 to 1943, based on district foresters' observations over the whole country, as embodied in answers to a specially prepared questionnaire. These show that a good seed crop of Pine and Spruce occurs about every 5, and of Oak every 3 years, and that Pine and Spruce usually seed well in the same year.

1706. GODNEV, E. D. Plodonošenie sosnovyh nasaždenij v Buzulukskom boru. **[Fruiting of Pine stands in the Buzuluk Pine forest.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (128–42). [Russ.]

An analysis of data covering 1911–50. Ca. 25% were good seed-years; the best-quality seed (as judged by germinative energy) came from trees in the most unfavourable conditions, i.e. dry sites, while the biggest and heaviest seeds were from rich, moist sites. Seed quality was higher in cones from the top part of the crown.

1707. GIRGIDOV, D. JA. Metody povyšenija semenonošenija sosny obyknovennoj. **[Methods of increasing the seed-bearing of *Pinus sylvestris*.]** In *Voprosy lesovedenija i lesovodstva*. Moscow. 1960. pp. 157–70. [Russ.E.]

Studies since 1935 have shown that attempts at changing the normal metabolism so as to promote the accumulation of carbohydrates and minerals in the crown in a definite proportion (e.g. by girdling, root pruning, glucose injections, etc.) failed to stimulate seed production. Thinning, however, did so, and some general recommendations are made, although no universal thinning regime can be worked out. Fertilizing, too, is a promising method of increasing seed production. The effect of meteorological conditions on the differentiation of the generative buds is discussed; if the mean moisture deficit at 1 p.m. rises above normal in July and/or August, conditions become more favourable (in the Leningrad region) for the differentiation and development of ♀ buds, on the quantity of which depend both the degree of flowering in the following year and the seed yield in the year after. Accordingly, a rough seed-yield forecast can be made 28 months in advance.

1708. TIMOFEEV, V. P. Urožai semjan v listvenničnyh nasaždenijah Lesnoj opytnoj dači TSHA. **[Larch seed yields at the experimental forest of the Timirjazev Agricultural Academy.]** *Izv. Timirjaz. Sel.'-hoz. Akad.* 1960 (3), (152–64). 17 refs. [Russ.e.] O.W.

Studies were made of seed-bearing in stands of several species of Larch, and data are tabulated, mainly for *Larix decidua* and *L. sukaczewii*, on the amounts and quality of seed produced over a number of years in plantations of various ages. The value of medium-aged Larch stands as seed sources in the conifer/hardwoods zone and in the forest-steppe zone of European Russia is emphasized.

1709. MELCHIOR, G. H. Ringelungsversuche zur Steigerung der Blühwilligkeit an japanischer Lärche (*Larix leptolepis* (Sieb & Zucc.) Gord.) und an europäischer Lärche (*Larix decidua* Mill.). **[Experiments in girdling to promote flowering of Japanese and European Larch.]** *Silvae Genet.* 9 (4), 1960 (105–11). Many refs. [G.g.e.f.]

European Larch grafts were girdled at intervals of 4 weeks during the 1957 growing season. Girdling up to the end of May increased the number of flowers (especially ♀ flowers) in the following growing season. Girdling at the end of June and during July had effect in the second growing season after treatment. It seems, therefore, that flower initiation takes place before the end of June. The later the girdling, the greater the number of deaths due to drying out; deaths were fewest with girdling in May. During the 1958 season both European and Japanese Larch were girdled up to the end of May. In both species, the number of both ♂ and ♀ flowers was significantly increased. Each clone has a specific flowering reaction to girdling. This can be assessed in a poor flowering year by counting the number of flowers and comparing with control plants. Untreated and treated Japanese Larch grafts differ significantly from European Larch grafts of the same age in the number of ♂ flowers produced. The European Larch grafts show a relatively greater increase after girdling. Terminal shoot growth was more reduced in Japanese than in European Larch. An accumulation of assimilates can be only partly responsible for the induction of flowering after girdling.

1710. Bilan, M. V. **Stimulation of cone and seed production in pole-size Loblolly Pine.** *For. Sci.* 6 (3), 1960 (207–20). 32 refs.

A 5-year study on the effects of (*a*) full crown release, (*b*) partial girdling, and strangulation by (*c*) wire and (*d*) metal bands showed that (*a*) gave a sevenfold increase in cone production in the 3rd and a fourfold in the 4th year. This treatment almost doubled the number of viable seeds per cone, and stimulated diameter and crown development, besides improving light and soil-moisture conditions. Treatments (*b*) and (*c*) increased cone and seed production, but not significantly, and they reduced diameter growth; (*d*) actually reduced cone production. Data are tabulated of cone and seed production, growth, food reserves in 1- and 2-year twigs, and light and soil moisture. Pre-harvest crown release is recommended as biologically and economically sound silviculture for seed production in pole-size Loblolly.

1711. Grano, C. X. **Strangling and girdling effects on cone production and growth of Loblolly Pine.** *J. For.* 58 (11), 1960 (897–8).

In a study on 54 *Pinus taeda* trees of 3·1–14·9 in. d.b.h. that had previously produced few or no cones, one tree in each of 18 groups of 3 was strangled with a ¾-in. steel band tightened with a bolt to exert pressure round the stem 12 in. above the ground, and another was girdled by removing a strip of bark 1 in. wide in the form of two overlapping half-rings with a 3-in. vertical separation between them. The third tree in each group was a control. The steel bands were removed after 1½ or 3 years (according to d.b.h.) to prevent envelopment by the tree. Cone counts were made annually for 8 years with 6-power binoculars. Cones were few on all trees, mean cone yield per tree for the period being: control 68, girdled 41, strangled 75. Neither the over-all differences nor the differences within diameter classes were statistically significant. Neither girdling nor strangling had a detrimental effect on diameter or height growth.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

1712. **Collection and storage of Ash, Sycamore and Maple seed.** *Leafl. For. Comm., Lond.* No. 33 (rev.) 1960. pp. 11. Price 9*d.*

Fraxinus excelsior, Acer pseudoplatanus, A. platanoides and *A. campestre*.

1713. Syverson, M. L. **Cone cutter.** *Tree Plant. Notes* No. 42, 1960 (1–2).

Describes, with scale plans, a home-made cone-cutter. [Cf. *F.A.* 18 No. 341.]

1714. Swofford, T. F. **Dewinging damage to Slash Pine seed.** *Tree Plant. Notes* No. 42, 1960 (3).

The seed-coat of *Pinus elliottii*, being much softer than the coats of other Southern Pines, is often scarified during de-winging, which may lower germination. Suggestions are made for reducing this damage.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

1715. Bayer, O. Das neue Forstsaatgutgesetz. **[The new [Austrian] forest seed law.]** *Öst. Vjschr. Forstw.* 101 (2), 1960 (65–80). [G.]

Presents, with comments, the text of the Federal Law of 18th May, 1960, regulating the production and sale of forest seed and planting stock (including vegetatively propagated Poplars and Willows).

232.315. Seed Storage and Treatment

See also Nos. 1544, 1712, 1730, 1732, 1771.

1716. Holmes, G. D., and Buszewicz, G. **Forest tree seed investigations.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (15–8).

Beech seed was dried down to 9% m.c. without damage, and viability maintained at a satisfactory level for 22 months at +2° C. in a current of air maintained at 45% r.h. Refrigerated storage in sealed containers at 20–25% m.c. and a temperature of −10° C. gave 70–90% germination after 21 months.

1717. Nyholm, I. Flerårig opbevaring av bøgeolden. **[Storing Beech nuts over several years.]** *Dansk Skovforen Tidsskr.* 45 (10), 1960 (377–415). 16 refs. [Dan.dan.]

Reviews literature and presents the results of original experiments on the effects of seed moisture-content and temperature on germination after storage periods of ⩽3 years. Detailed results of two series of experiments, in 1955–57 and in 1956–60, are given in graphs and tables. Storage temperatures <0° C. (−5° or −15°) proved necessary for storage over long periods, those of +2° to +5° being suitable only for seed collected in autumn and sown in the following spring. Recommendations are made on storage conditions at −5° or −15° for seed to be sown in the following spring, and 1½, 2½ or 3½ years later.

1718. Fuisz, J. A fehérnyármag tárolása. **[Storage of seed of *Populus alba*.]** *Erdö* 6 (1), 1957 (37–9). [Hu.] From *abstr.* in *Hung. agric. Rev.* 6 (3), 1957 (7). [E.] C.G.B.

Among methods tested (storage *in vacuo*, ultra-violet and infra-red treatments, etc.) storage with an equal weight of dried peat proved best. The peat is heated in an ordinary boiler to 100–120° C., thereby losing all its water. It is then cooled to 50°. Poplar seed so stored showed 33% germination after 26 days. This method is recommended because it is simple, practicable at the extraction point, and allows of transport and supplementary sowing; decay is diminished and cost of plants is reduced.

1719. Herrero, J. Ensayos sobre propagación de *Juniperus thurifera* L. **[Experiments in the propagation of *J. thurifera*.]** *Anales de la Estación Experimental de Aula Dei, Zaragoza* 6 (1/2), 1959 (94–105). 8 refs. [Span.span.e.] E.M.B.

J. thurifera is thought to be a promising species for the afforestation of the Aragon plains. Experiments were therefore undertaken in (1) vegetative propagation with the aid of growth regulators and (2) seed treatment. (1) No conclusive results were obtained; it seems that *J. thurifera* cannot easily be propagated by this means. (2) Three months' stratification at 12–20° C. of seed collected in October, followed by 3 months' stratification at 5° C. gave the highest germination %. Stratification for 17 months at normal temperatures also gave reasonable germination.

1720. Schubert, J., Brockhof, G., and Nehne, G. Beiträge zur Verbesserung der Forstpflanzenanzucht, Mitteilung II: Ein Vergleich verschiedener Vorbehandlungsmethoden bei Saatgut von *Pinus silvestris* L., *Picea abies* (L.) Karst., *Larix decidua* Mill. und *Abies alba* Mill. **[Contributions to the improvement of forest nursery practice. Report 2: A comparison of various pretreatments of the seed of Pine, Spruce, Larch and Silver Fir.]** *Arch. Forstw.* 9 (7), 1960 (639–64). 23 refs. [G.g.russ.e.]

The treatments, covering one season and two localities, were mainly variants of (*a*) moist-cold stratification, up to 28 days at 3–4° C., and soaking in tapwater (*b*) up to 10 days at 8° and (*c*) up to 5 days at 18°, with changed or flowing water. In all four species, pretreatments increased the % germinating early but only in Larch was the germination period reduced (120 to 38 days). Maximum germination %'s of viable seed were 95, 92, 90 and 27 for Fir, Pine, Spruce and Larch respectively, representing increases over controls of 18, 1, 4, and 200%, those for Fir and Larch being highly significant. Under unfavourable conditions, pretreatment depressed plant production in Pine. Significant increases in shoot weight per 100 plants were shown only for Fir and only from treatment (*a*) and from (*c*) with 48-hr. soak and one change. Treatment (*a*) gave the best all-round results for Larch and Fir; Larch probably requires longer than 28 days. Fir seed was definitely damaged by 6 hours' heating at 30° (to distil off turpentine). Material from these treatments has been transplanted in the nursery (Spruce and Fir) and planted in the field (Pine) for further observation and report. [Cf. *F.A.* 22 No. 1746.]

1721. Malac, B. F. **More on stratification of Pine seed in polyethylene bags.** *Tree Plant. Notes* No. 42, 1960 (7–9). 2 refs.

[Cf. *F.A.* 21 Nos. 390, 4299.] Experiments were made to determine the effectiveness of this treatment on larger lots of seed, using Slash and Loblolly Pine. It is concluded that seed lots as large as 5 lb. may be stratified in polythene bags with no ill effects or loss of germination; 10-lb. lots lost ca. 5% germination, and 25-lb. lots 10%.

1722. Harrington, T. A. **Stratifying repellent-treated Pine seed.** *Tree Plant. Notes* No. 42, 1960 (5).

Germinative capacity of Loblolly, Shortleaf, and Virginia Pine may be seriously reduced if the seed is repellent-coated and then stratified while fresh. Cold storage for a few months before treatment and stratification largely prevents this damage.

1723. Arhipova, V. D. Rozvytok mikoryzy na korincjah sijanciv, jaki vyrosly z žoludiv, protrujenyh fungisydami. **[Development of mycorrhiza on roots of seedlings grown from fungicide-treated acorns.]** *Ukrajins'kyj Botaničnyj Žurnal, Kyjiv* [*Kiev*] 15 (4), 1958 (75–80). 25 refs. [Ukr.russ.e.] C.G.B.

The development of mycorrhiza was investigated in 1- to 3-year Oak seedlings from acorns treated with granosan and formalin solution in 3 zones of the Ukraine (forest, forest-steppe and steppe) in 1954. No difference was noted between seedlings from treated and control acorns. By clipping seedling roots and cotyledons at the first stage of development it was established that the death of weak seedlings may be caused by early loss of the cotyledon. It appears that treatment of acorns with fungicide does not affect the development of mycorrhizae.

1724. Lindquist, C. H. **Note on the moisture requirements of the stratifying media for seed of *Caragana arborescens*, Lam.** *Canad. J. Pl. Sci.* 40 (3), 1960 (576–7). 3 refs. O.R.E.

Germination was greatest after stratification in Ottawa Silica (O.S.) sand at 10% m.c., but not significantly greater than that for O.S. sand at 5% m.c. or local sand at 10% m.c. Germination was significantly less after stratification in O.S. sand at 20 and 25% m.c.

1725. Tompa, K. Megjegyzés az akácmag vetésre való elökészítéséhez. **[Notes on the treatment of *Robinia pseudoacacia* seed before sowing.]** *Erdö* 7 (3), 1958 (81–7). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (3), 1958 (8). [E.] C.G.B.

Describes a scarifying machine consisting of a cylinder, 60 × 28 cm., in which 6 disks are revolved on a central shaft. Both cylinder walls and disks have an abrasive surface. The machine holds 4 kg. of seed, which can be treated in 15 min. Germination after this treatment is better than that after boiling-water or acid treatment.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 1434–5, 1568, 1570–1, 1818.

1726. Bouvarel, P., and Lemoine, M. **Propagating box for forest seeds used by the research station at Nancy.** *Transl. For. Timb. Bur. Aust.* No. 47, 1959. pp. 2. Transl. by B. H. Kaulla from *Rev. for. franç.* 10 (4), 1958 (279–83). [See *F.A.* 19 No. 4090.] Limited distribution.

1727. Hietbrink, H. Inwendige bruinverkleuring van inlandse eikels (*Quercus robur*). **[Internal discoloration of acorns of *Q. robur*.]** *Ned. Bosb. Tijdschr.* 32 (11), 1960 (414–7). [Du.e.]

When samples of acorns for export were examined in 1959, varying degrees of brown to black discoloration were found on the transverse and longitudinal sections. A scale of severity of discoloration (illustrated) was prepared. As culture experiments yielded no evidence of parasitic fungi it is suggested that the cause is physiological. Germination % was found to decrease with increasing discoloration. Results are tabulated.

232.32. Plant Rearing. Nursery Practice

See also Nos. 1683, 1777–8, 1892.

1728. TÓTH, K., and VILCSEK, J. A csemetekerti, erdősítési és fásítási munkák gépesítése. **[The mechanization of nursery and plantation work.]** *Erdő* 7 (11), 1958 (409–16). [Hu.russ.g.]

Discusses, with illustrations, special machines shown at Szolnok (forest ploughs, hedge [cutting] machines, plant lifters, hole borers, and planting machines).

1729. SIMPENDORFER, L. B. **Plant nursery and arboretum, Woomera, South Australia.** *For. tech. Pap. For. Comm. Vict.* No. 4, 1960 (13–7).

Discusses the work of the Woomera nursery and arboretum since its establishment in 1947, listing the tree species that have been successfully sown in seedpans, transferred to pots, and planted out. Over 32,000 trees have been put out in streets, open areas, and plantations, of which 1500 have so far required replacement. A list of additional species being raised (1959) for trial planting is given.

1730. BABB, M. F. **Propagation of woody plants by seed with notes on other methods of reproduction.** *Bulletin, Alaska Agricultural Experiment Station, Palmer* No. 26, 1959. pp. 12 + 1 tbl. 16 refs.

Discusses different methods of propagation and presents tables, based on materials acquired by the Experiment Station, one showing methods of propagating 56 genera and the other the stratification period for some 150 species. Some of these genera are of limited use in Alaska.

1731. VAKULJUK, P. G. Vyraščivanie sejancev drevovidnyh iv. **[Raising seedlings of tree Willows.]** *Lesn. Hoz.* 12 (4), 1960 (78–9). [Russ.]

An account of nursery practice in raising *Salix alba* and *S. fragilis* from seed, in the Ukraine.

1732. FAULKNER, R., and ALDHOUS, J. R. **Nursery investigations.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (18–32). 2 refs.

Stratification of Fir seed: In the series of investigations of techniques for raising seedlings of various species of Fir (*Abies balsamea*, *A. grandis*, *A. lowiana*, and *A. nobilis*), this year's results contradicted last year's [cf. *F.A.* 20 No. 4445] in many cases. More work is necessary to elucidate the conditions under which seed stratification or prechilling, and early or late sowing, are beneficial or harmful.

Long-term fertility demonstrations: It was found that, after up to 9 years' continuous manuring and cropping with Sitka Spruce seedlings, treatments containing either hopwaste, or hopwaste/bracken compost maintained a higher level of fertility than those using inorganic fertilizers alone.

Inorganic fertilizers—nitrogen: Late and heavy applications of N fertilizers were shown to delay the formation of terminal buds of seedlings by 2–3 weeks in some cases, but no increased susceptibility to autumn frost damage has yet been demonstrated.

Fertilizer damage to transplants: Early spring (early March) applications of a NPK fertilizer to transplant lines were found to be damaging; but negligible damage was done by mid-April dressings up to 8 cwt./acre. Corsican Pine and Norway Spruce were more susceptible than Scots Pine.

Intensive methods of raising seedlings: In an experimental Dunemann seedbed at Kennington nursery, although yields were high and growth good, they were no better than in conventional seedbeds in other parts of the nursery. The species tested were Sitka Spruce, Japanese Larch, and Western Hemlock. The effect of covering seedbeds of Japanese Larch and Douglas Fir with polythene sheets, from the date of sowing until 4 weeks after seedling emergence, was to increase height growth at the end of the season by ca. 20%; there was no increase in number of seedlings per sq. yd.

Irrigation: Despite the wet summer from July onwards, irrigation of seedbeds whenever soil moisture deficit exceeded 0·5 in. resulted in significantly greater height growth in 8 of the 9 species sown. In the case of *Tsuga heterophylla* and *Abies nobilis*, it also accelerated germination and increased the yield of seedlings.

Seed dressings: A number of fungicidal seed dressings were tested to see whether they had any consistent effect on germination in seedbeds, but no consistent benefits were shown. It is clear that the large difference between the number of viable seeds sown and the number of seedlings that emerge is not due in any appreciable measure to seed-borne fungi.

Protection against birds: The insecticide dieldrin has sometimes been observed to act as a bird repellent, but trials of dieldrin sprays on nursery beds showed it to be quite ineffective in practice.

Weed control: A number of chemical weedkillers were tested for their effect on weeds and on conifer seedlings and transplants, but none of them approached the currently used vaporizing oil or white spirit in efficiency or low cost. Tests of weed-suppressing mulches of black polythene sheeting, sisalkraft paper, and foil, as used in the horticultural industry, were unpromising. They are unlikely to have a future in forest nursery practice in view of the difficulty of handling and poor weed suppression achieved. Good control of weeds in newly planted Poplar plantations was obtained with a single application of 4 lb. monuron in 100 gal. water/acre, with on damage to the Poplars.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 1749, 1954.

1733. HODGES, C. S. **Effect of soil fumigation in the nursery on growth of Loblolly Pine seedlings and control of weeds.** *Tree Plant. Notes* No. 42, 1960 (23–7). 12 refs.

The following treatments were tested: (1) MeBr (*a*) at 1 lb./150 sq. ft. (300 lb./acre) under a polythene cover, (*b*) vaporized and released at 300 lb./acre under polythene covers laid down by an automatic covering device, (*c*) as Brozone (50/50 MeBr and petroleum carrier) at 175 lb./acre injected into the soil and covered with polythene or left uncovered; (2) Vapam (*a*) at 50 and 100 gal./acre drenched into the soil with 1300 gal. water, or (*b*) at 50 gal./acre drenched into the soil and covered for 2 days with polythene. All treatments except (2*a*) gave increased seedling growth and reduced weeds, Brozone being regarded as particularly promising, since its application is highly mechanized (injected into the soil with chisel applicators and the soil then covered with polythene) and 6 acres/day can be treated vs. 1 acre by the standard method. Additional tests were made with a weedkiller, Eptam (ethyl di-*n*-propylthiolcarbamate) and a nematocide (Nemagon). The former gave very good weed control up to 12 weeks after planting; the latter only slightly increased seedling size and much increased weed growth.

1734. Stoeckeler, J. H., and Arneman, H. F. **Fertilizers in forestry**. *Repr.* from *Advances in Agronomy, New York* 12, 1960 (127–95). 204 refs.

A review of world literature in two parts: (1) Soil fertility in forest nurseries, and (2) Fertilization of forest trees.

1735. Syvorotkin, G. S., Dmitriev(n)a, E. A., and Grekhova [Grehova], M. V. **On the use of [mineral] fertilizers in forest nurseries**. *Transl. For. Prod. Lab. Can.* No. 56253, [*n.d.*] pp. 13. Transl. from [*Trudy Vsesojuznogo Naučno-Issledovatel'skogo Instituta Železno-Dorožnogo Transporta* No. 129], 1957 (172–82). [See *F.A.* 20 No. 1731.] Limited distribution.

1736. Wilde, S. A. **Liquid fertilizer treatments of nursery soils—their advantages and shortcomings.** *Tree Plant. Notes* No. 42, 1960 (11–2). 5 refs.

Reviews the literature on the subject and concludes that the use of liquid fertilizers is a valuable auxiliary method of maintaining soil fertility, but that their use alone or indiscriminately has harmful results. Top dressings of solid fertilizers applied between rows are also deprecated.

1737. Faulkner, R. **Summary of recent research into N manuring of conifers in nursery seedbeds in Scotland and Northern England**. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (141–60). 13 refs.

Summarizes the results of a long series of experiments [cf. *F.A.* 17 No. 1495]. Under the usual acid conditions of conifer nurseries, N is generally best applied in the form of Nitrochalk. $(NH_4)_2SO_4$ should be used only where it is desirable to remove free lime from the soil and reduce the pH. Urea has no advantage over Nitrochalk, and in some cases reduced seedling yields. NH_3, applied as a 0·88 solution in water, similarly had no advantages, and is more difficult to handle. The best rates of application were from 5 to 10 lb. of Nitrochalk per 100 sq. yd., split into two top dressings, given in mid-July and mid-August. Earlier applications gave poorer growth responses. There is no evidence that late and heavy applications of N fertilizers induce susceptibility to damage by early autumn frosts.

1738. Faulkner, R. **Summary of recent research into phosphate and potash manuring of conifers in nursery seedbeds in Scotland and Northern England.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (126–40). 9 refs.

Summarizes the results of a long series of experiments. The main results are that, with P and K fertilizers, there is no danger in applying fertilizer on the day of sowing, provided that it is well mixed in with the soil. Equally good results are obtained if applied earlier, up to 16 weeks before sowing. The currently recommended rate of 14 lb. of superphosphate per 100 sq. yd. of nursery bed is satisfactory for Japanese Larch, Western Hemlock, and Douglas Fir, but for Sitka Spruce 1½–2 times this amount is recommended, as giving worthwhile growth increases. For all four species, applications of K_2SO_4 at 4–5 lb./100 sq. yd. are generally adequate.

1739. Asahi, M. **[Studies on the improvement of the fertilizing method in nursery (II). Phosphorus and potassium content of seedlings of *Abies mayriana* in growing season.]** *J. Jap. For. Soc.* 41 (6), 1959 (225–8). 7 refs. [Jap.jap.e.*e.*]

Reports on an investigation of the behaviour of N, P and K as absorbed by one-year *A. mayriana* seedlings. From the results, the nutrient elements are assumed to behave characteristically, N and P accumulating in the early period of the growing season before removal, and K in the middle period.

1740. Ahromejko, A. I., and Savina, A. V. Vlijanie fosfornyh udobrenij na rost sejancev drevesnyh rastenij. **[Effect of P fertilizers on the growth of tree seedlings.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (95–115). 7 refs. [Russ.]

Results showed that 1-year Norway Spruce seedlings utilized scarcely any P from labelled superphosphate applied to the soil before sowing, whereas seedlings of *Tilia* sp., *Fraxinus pennsylvanica*, *Acer platanoides* and *A. negundo* used up to 80%, and Scots Pine seedlings up to 15%. For best effect, the fertilizer should be placed 3–5 cm. deeper than the seeds. Mineral fertilizers should be given only to quickly growing plants in the first year; others should be given lime and organic fertilizer. Within 24 hr. of applying foliar sprays of 2% P to Oak, Pine, Spruce etc., noticeable quantities of the P were observed in the stems and roots and also in adjacent unsprayed plants, including herbaceous species. P introduced into the leaves moved to the roots and into the soil at a rate of 30 m./min. [cf. *F.A.* 19 No. 78]. Application of P to the leaves increased the dry weight, height, and diameter growth of several species of tree seedlings by 25–50%; application of fertilizer to the roots had a much slighter effect.

1741. Papp, L. O fenyöcsemetenvelés biztonságának fokozása alföldi homokon. **[Improving the production of Pine seedling stock in the sandy areas of the Great Plain.]** *Erdö* 7 (3), 1958 (111–8). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (3), 1958 (9). [E.] C.G.B.

From a 6-year study it is concluded that *P.*

sylvestris can be raised without the usual, but possibly objectionable, irrigation and shade, in soils of good or improved water regime. For the latter the *Egerszegi* method of deep manuring is advised—a 2-cm. layer, at 60 cm., of 0·5 cu. m. each of compost and ground-up peat plus 15 kg. of "Peti" salt and 18 kg. each of superphosphate, potash (40%) and bentonite. Effects last into a second rotation of seedlings and produce excellent root systems.

1742. Agnistikova, V. N., and Ščerbakov, A. P. O vlijanii mikroėlementov na rost sejancev sosny, vjaza, žimolosti i nakoplenie uglevodov. **[Effect of trace elements on the growth of seedlings of *Pinus sylvestris, Ulmus laevis* and *Lonicera tatarica* and the accumulation of carbohydrates.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (114–28). 25 refs. [Russ.russ.]

[Cf. *F.A.* 21 No. 4140.] On poor, sandy soils, Cu and Mn improved the growth of *P. sylvestris* and Mn and Zn that of *U. laevis*; doses were (over two years): $MnSO_4 \cdot 5H_2O$—22·5 kg./ha.; $CuSO_4 \cdot 5H_2O$ and $ZnSO_4 \cdot 7H_2O$—15 kg./ha. On a heavy clay-loam, the $CuSO_4$ applied at 7·5 kg./ha. over two years improved the growth of *L. tatarica.* B applied as 15 kg. H_3BO_3 per ha. over two years depressed growth of *P. sylvestris*, and Mg at 15 kg. $MgSO_4$ per ha. over two years depressed growth of *L. tatarica.* The trace elements affected the rhythm of growth of the various organs, both in time and in rate. Trace elements cause changes in the total content of carbohydrates in the leaves at different periods of the growing season, and increase the relative content of soluble forms of carbohydrates.

1743. Levisohn, I., and Parry, M. E. **Researches in mycorrhiza and soil mycology.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (91–4). 6 refs.

Activity of certain root-infecting fungi in nursery soils of the agricultural type. The way in which soil sterilization in nursery soils of this type acts to stimulate the growth of conifer seedlings, is still something of a mystery. Cytological examination of healthy seedlings raised on sterilized soil has shown that no mycorrhiza is found even two years after sowing. On the other hand, an intercellular haustorial infection has been found, that does not appear to harm the seedlings. The nature of this fungus is being examined.

Antagonistic effects of a mycelium common in certain nursery soils on various ecological groups of fungi. Investigations into the antibiotic activity of *Alternaria tenuis* [cf. *F.A.* 18 No. 3782] have been continued. It was found to inhibit the growth of several timber decay fungi, viz. *Armillaria mellea, Fomes annosus, Pleurotus ostreatus,* and *Polyporus betulinus, in vitro*, though it is doubtful whether these effects will be repeatable in natural soil. It has also been found to inhibit the growth of a number of mycorrhiza-formers, but to have no effect on a number of 'pseudo-mycorrhizal' fungi and other parasitic root associates such as *Verticillium* and *Pythium.*

The stimulation of Pine seedlings by the mycelium of Tricholoma albobrunneum. This basidiomycete, common in good stands of Pines in various parts of England, showed, in experiments carried out in soil pits, a stimulating effect on the growth of Pine seedlings, and will be tested in nursery experiments as a source of mycorrhizal inoculation.

1744. Moser, M. **The artificial inoculation of forest plants with mycorrhiza fungi. II. The peat litter culture of mycorrhiza fungi.** *Transl. For. Prod. Lab. Can.* No. 56738, [*n.d.*]. pp. 13. 10 refs. Limited distribution. Transl. from *Forstwiss. Cbl.* 77 (9/10), 1958 (273–8). [See *F.A.* 20 No. 1735.]

1745. Moser, M. **The artificial inoculation of forest plants with mycorrhizae. III. The methodology of inoculation in tree nurseries.** *Transl. N.Z. For. Serv.* [*n.d.*]. pp. 11 + orig. text appended. Transl. from *Forstwiss. Cbl.* 78 (7/8), 1959 (193–202). [G.] [See *F.A.* 21 No. 408.] Limited distribution.

232.323. Sowing and Covering

1746. Schubert, J., Achterberg, H. H., and Brockhof, G. Beiträge zur Verbesserung der Forstpflanzenanzucht. Mitteilung I: Über den Einfluss verschiedener Bedingungen bei der Aussaat von *Pinus sylvestris* L. und *Picea abies* (L.) Karst. auf die Pflanzenausbeute. **[Contributions to the improvement of forest nursery practice. Report I: The influence of various factors on plant production in sowings of Pine and Spruce.]** *Arch. Forstw.* 9 (7), 1960 (615–38). 20 refs. [G.g.russ.e.]

Results of replicated trials of band sowings (8 and 2 cm. wide), for 3 seasons in 4 localities in Saxony show that, with correct practice, plant % is unaffected by locality, which, however, definitely affects growth (shoot weight/plant), particularly through local weather. Growth is greatly stimulated, at negligible cost in labour, by 8–10 weedings rather than the standard 3. Covering seed with C-horizon sand, compared with A-horizon top soil, significantly increased the plant % of Spruce but not of Pine and had no effect on growth. Sowing density influenced plant % far less than it did growth, which decreased greatly with increasing density. Band width scarcely affected plant %, but could affect growth both by reinforcing adverse conditions (competition) and reducing them (mutual protection). A good compromise width was 8 cm., with optimum sowing densities in seeds/sq. dm. of 30 (Pine) and 33 (Spruce), yielding up to 129,000 plants per kg. of seed, and an end-of-season stock (after thinning) of 150–200 seedlings/running m. [Cf. *F.A.* 22 No. 1720.]

1747. Shoulders, E. **Seedbed density influences production and survival of Loblolly and Slash Pine nursery stock.** *Tree Plant. Notes* No. 42, 1960 (19–21).

Recent studies in Louisiana, comparing densities of 10, 20, 30 and 40 seedlings/sq. ft. of nursery bed indicate that a density of 40/sq. ft. is preferable to lower densities in terms of both plantable size and effective seedlings produced ('effective' seedlings being plantable seedlings that survive 1 year in the field). Lower densities may be desirable if the criterion is larger seedlings or more grade-1 stock.

1748. FEKETE, J. Tapasztalatok a tölgycsemete bojtos gyökerüvé neveléséről. **[Experience in raising Oak seedlings with bushy roots.]** *Erdö* 7 (1), 1958 (20–2). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (10). [E.] C.G.B.

In an acorn batch, 66% germinated (*a*) and were sown after removing "sprouts" [radicles?]. The rest (*b*) were grown whole. Of the resulting 1-year seedlings, root-pruned to 12 cm. in spring and lifted that autumn, (*a*) supplied 11% having bushy root systems above pruning level and 49% [twice pruned] bushy throughout. The other 40%, from (*b*), had bushy roots only at the second pruning level.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also Nos. 1782–3.

1749. DICKSON, A., LEAF, A. L., and HOSNER, J. F. **Seedling quality—soil fertility relationships of White Spruce, and Red and White Pine in nurseries.** *For. Chron.* 36 (3), 1960 (237–41). 5 refs.

[Cf. *F.A.* 21 No. 4318.] An index based on combined morphological features of seedlings was used to relate seedling quality to different levels of nursery fertility as determined by soil and seedling analysis. The index is based on the formula $x/(y + z)$ where x = dry seedling weight in grams, y = the quotient of height (in cm.)/diam. (in mm.), and z = the ratio of top/root in grams. In this index the dry seedling weight is heavily weighted, but the index is lowered if the seedlings are spindly or unbalanced. There was a lack of correlation between index and nutrient level of the soil as determined from soil analysis, but a good correlation with nutrient content of seedlings.

232.325. Tending (in both Seedbeds and Transplant Beds)

1750. KINGSTON, B. **A nursery sprinkler.** *Tech. Note For. Dep. Uganda* No. 85 (60), 1960. pp. 2.

Describes, with scale diagrams, a sprinkler designed and tested at the Forest Department nursery, Jinja. Cost, excluding roses and supply hose, is ca. 75*s*.

1751. KARSCHON, R. **Nursery techniques for Eucalypts. I. Irrigation of balled stock.** *Leafl. For. Res. Inst., Ilanoth* No. 9, 1960. pp. 4. 5 refs.

Gives data covering three seasons, on the amounts of water applied by overhead irrigation to *Eucalyptus rostrata* and *E. gomphocephala* transplanted into standard tins (25 × 25 × 15 cm., 10 plants/tin) in mid-June, when they were 5 weeks old, until the end of December. The water applied (116 watering days) was 13 cu. m./1000 plants. It is thought that this is rather in excess of the amount required for raising well hardened stock; further trials are necessary.

1752. PŠENIČNYJ, I. E. Vyraščivanie sejancev platana v Krymu. **[Raising seedlings of *Platanus* spp. in the Crimea.]** *Lesn. Hoz.* 12 (7), 1960 (39–40). [Russ.]

An account of nursery irrigation schedules with *P. orientalis* and *P.* × *acerifolia*, with recommendations.

1753. **Water requirements of seedlings [of *Acacia senegal*].** *Extr.* from *Rep. For. Dep. Sudan 1958/59*, 1960 (85).

Experience has shown that watering does not have a beneficial effect if continued during the dry season. The Acacia seedling sends down a long taproot (seedlings 2 months old had roots 5 ft. long), and the few lateral roots that develop in the early stages probably cease to function as the topsoil dries out. The seedling then draws its water from the lower moist soil layer through other side roots sent out by the taproot. In sand soils, watering may even be harmful. Heavy mortality in El Obeid nursery during Jan.–Feb. 1959 was attributed to a "damping-off" effect, the topsoil being damp, and the tap-root in this region not being able to absorb the water.

1754. ČERVINKOVÁ-JERMANOVÁ, H. Příspěvek k využití selektivních herbicidů v lesnictví. (Simazin). **[The use of selective herbicides in forestry. Simazin.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (5), 1960 (387–94). 33 refs. [Cz.cz.russ.g.]

[Cf. *F.A.* 21 No. 1714.] Reports preliminary nursery trials in which it was found that simazin sprays (0·4% aqueous suspension) had no detrimental effect on the development of 1- and 2-year-old *Pinus sylvestris* when applied as an over-all spray at 0·6, 0·8 and 1 g./sq. m., nor on 2-year-old *Picea abies* and *Tilia* sp. when applied between the rows at 1 g./sq. m. Sprays were best as a pre-emergence treatment, or when the weeds were young. With mature weeds even 1·6 g./sq. m. proved ineffective. Dry weather reduced the herbicidal effect.

1755. ČISLOV, JU. A. Mehanizacija mul'čirovanija posevov v lesopitomnikah. **[Mechanized mulching of sowings in forest nurseries.]** *Lesn. Hoz.* 12 (5), 1960 (60–1). [Russ.]

Describes, with drawings, the MN-1·0, a tractor-mounted and -powered mulcher that distributes sawdust (or comminuted peat) in a strip 1 m. wide and covers 2 ha. per [8-hr.] shift.

1756. SATO, K., OTA, N., and SHOJI, T. **[Effect of the covering of several coniferous seedlings with mulches in autumn on the outbreak of snow moulding.]** *J. Jap. For. Soc.* 41 (1), 1959 (32–4). 4 refs. [Jap.]

Mulching beds of coniferous seedlings with leaf litter, Sasa litter, or straw before winter, encouraged snow-mould, especially the leaf litter (45·5% diseased vs. 18·2% for the control).

1757. WEBSTER, G. R., and ADAMSON, R. M. **Effects of sawdust used as a mulch and as a soil amendment on soil temperatures under irrigated and unirrigated conditions.** *Canad. J. Soil Sci.* 40 (2), 1960 (207–11). 6 refs. O.R.E.

Soil temperatures were measured 3 times during the day at 4 in. below the surface of (*a*) sawdust-mulched, (*b*) sawdust-incorporated, and (*c*) control plots. Differences between treatments were greatest in July. Soil temperatures were lower in (*a*) than in (*c*), except at 7.30 a.m. under irrigation. After Aug.

with irrigation, and after Oct. without it, the soil temperatures became higher in (*a*) than in (*c*). Technique (*b*) had little effect on soil temperatures. Blackening the mulch markedly reduced the differences between (*a*) and (*c*).

232.327. Protection Measures in Nurseries

See Nos. 2009–17.

232.328. Vegetative Propagation

See also Nos. 1438, 1719.

1758. Miles, H. W., and Sykes, J. T. **Mist propagation: a report of the proceedings of the conference held at Wye College on December 15th, 1958.** Wye College, Ashford, Kent. 1959. pp. 53 + 2 tbls. Price 3*s*. 6*d*. E.M.B.

Contains the following papers, with discussions. Definition of terms (*A. W. Gray*); Mist installations (*F. H. Vanstone*); Control mechanisms (*R. C. Frampton*); Supplementary equipment (*D. B. Lowndes*); Housing mist propagation units (*E. E. Kemp*); The place and management of mist propagation in nursery practice (*E. C. Cordell*); Problems arising from the propagation of plant material in a controlled environment (*I. H. Williams*); Methods of extending the season of propagation of woody plants (*E. E. Emmerson*); Response of soft-wood cuttings to mist (*F. W. Shepherd*); Mist propagation at Wisley (*P. J. Dykes*); Fruit-tree propagation under mist out of doors (*E. S. J. Hatcher*); Factors affecting cutting response to mist (*J. T. Sykes*). The appendices give data on rooting abilities of a large number of trees and shrubs.

1759. Komissarov, D. A. Vegetativnoe razmnoženie drevesnyh rastenij čerenkami. [**Vegetative propagation of woody plants by stem cuttings.**] In *Voprosy lesovedenija i lesovodstva*. Moscow. 1960. pp. 199–212. [Russ.E.]

A summary of 20 years' investigations on 112 genera (240 species and forms). Lists species showing ≥90% and 80% rooting without growth stimulators, and also species which respond to stimulators. Optimum rooting conditions, and the differences between cuttings from seedlings and from young shoots on older trees are discussed.

1760. Larson, P. R. **Gibberellic acid-induced growth of dormant hardwood cuttings.** *For. Sci.* 6 (3), 1960 (232–9). 17 refs.

The apical surfaces of dormant cuttings of *Acer rubrum* and *A. negundo*, *Betula papyrifera*, *Juglans cinerea*, *Populus grandidentata* and *P. tremuloides*, *Prunus pennsylvanica*, *Quercus rubra*, and *Salix bebbiana* were treated with gibberellic acid (g.a.), 2,3,5-triiodobenzoic acid (TIBA), and 3-indoleacetic acid (IAA) at 0·25, 0·5, and 1% by weight with lanolin. G.a. induced preseasonal growth of the uppermost buds together with an unusual suppression of the lower buds, an effect increasing with g.a. concentration. This apical dominance was absent from cuttings treated with TIBA, while IAA caused a temporary delay in bud break in all buds. G.a. appears to have possibilities for breaking dormancy and prolonging the growth period.

1761. Chandler, C. **The propagation of *Larix* from soft-wood cuttings.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (32–9). 6 refs. [See *F.A.* 21 No. 1718.]

1762. Ortmann, C. Die Kultur von Kurzstecklingen. Ein Beitrag zur vegetativen Schnellvermehrung von *Salix* sp. [**The cultivation of short cuttings. A contribution to the rapid vegetative propagation of Willows.**] *Arch. Forstw.* 9 (6), 1960 (542–60). 12 refs. [G.g.russ.e.]

[Cf. *F.A.* 20 Nos. 500, 3105.] From growth data of 4 clones, the great advantages of 3- to 4-cm. cuttings of one-year wood raised under glass, over standard 20-cm. cuttings raised in the open, for research on clone characters, multiplying plant material, and commercial production, are argued in detail. In early March, cuttings 3–4 cm. long and ≥3 mm. diameter, consisting of internodes with their proximal and distal buds, are set upright, 400 to a transplant box, in sand over 0·5 in. of peat, liberally watered and kept at a maximum of 20° C. under a glass cover. In species with internodes > 4 cm. long, the proximal bud is sacrificed. At bud break, ca. 6 days later, the glass is removed from the boxes, and at leaf spread, nutrient solution is given, the sand being kept first liberally, and then moderately, watered. Some 2–3 weeks later (varying with the clone) the now rooted cuttings are put into 7-cm. pots, the lower half of which contains fairly heavy compost, the upper half being firmed on to the cutting with sifted peat and sand. The pots now receive fertilizer and plenty of water and are kept in a cold frame for ca. 6 weeks, the frame being left open for the last 2–3 weeks to harden the cuttings off. In mid-May, the thoroughly rooted balls are planted out at 50 × 50 or 60 × 60 cm. in moist soil, 2–3 cm. deeper than in the pot. At the wider spacing, this plant material costs 840 DM/ha., the same as the standard 20-cm. cuttings but with great advantages in survival and increment, cutting output, and extension of the productive bed area.

1763. Seitz, F. W. Die Vermehrung der Graupappel. [**Propagation of *Populus canescens*.**] *Holzzucht, Reinbek* 14 (3/4), 1960 (19). [G.]

Describes propagation by root cuttings from two-year-old seedlings. Roots are cut in the autumn and planted in spring, after cold storage, in 6- to 10-cm. sections in a greenhouse or heated frame. One shoot per section is allowed to develop, to be later transplanted. At the end of the second growing season, 2 + 1 plants are ca. 2 m. high. Up to 50 plants (usually 10–20) have been obtained from one seedling. Propagation from suckers, by stimulating suckering through cutting back of the roots and wounding the roots near the surface with a plough or cultivator, is also recommended. [Cf. *F.A.* 19 Nos. 4122–3.]

1764. Prokazin, E. P. Novyj metod privivki hvojnyh dlja sozdanija semennyh učastkov. [**A new method of grafting conifers for the creation of seed orchards.**] *Lesn. Hoz.* 12 (5), 1960 (22–8). [Russ.]

Describes the technique of spliced side grafting (veneer side grafting), and its use in several leskhozes.

in 1958 and 1959. Such grafts have proved successful with Spruce, Larch, Douglas Fir, and 7 species of Pine.

1765. VINCENT, G., HORÁK, K., and MALINA, A. Roubování modřínu. **[Grafting Larch.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (57–87). 27 refs. [Cz.russ.g.]

Reviews work in 1957–58 at Uherské Hradiště on grafting *Larix decidua*. Scions from the upper part of the crown were better than those from the lower part. Plants 3–4 years old, potted a year before grafting, made suitable stocks. Early spring was the best time, followed by later summer. Whip grafts and spliced side grafts were the best of the eight methods tried. Recommendations are made on grafting techniques for Larch.

1766. PITCHER, J. A. **Heteroplastic grafting in the genera *Acer, Fraxinus, Picea* and *Abies*.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (52–7). 7 refs.

Tabulates and discusses the results of (*a*) greenhouse and (*b*) field tests at Syracuse, N.Y., in which scions of 17 *Acer*, 5 *Fraxinus*, 11 *Picea* and 9 *Abies* species were grafted on stocks of *A. saccharum*, *F. americana*, *P. abies* and *A. balsamea* respectively. Temperature and humidity conditions were particularly severe in (*b*). Of the 4 genera, *Abies* proved easiest to graft, gave highest take—85% for (*a*) and 80% for (*b*)—and formed the best union most rapidly. *Picea* gave 63% take in (*a*) vs. 25% in (*b*), *P. schrenkiana* being the only species that did not take at all. *Fraxinus* performed poorly in (*a*) (17% take), much better in (*b*) (64%). *F. quadrangulata* failed to take in either. *Acer* was discouraging, since of 267 attempted heteroplastic graftings, comprising 16 species in 6 sections, only 14 grafts survived; these, however, represented 4 of the 6 sections. When studied, the grafts were still in their first growing season. Concrete statements about compatibility could not be made, as many grafts might yet succumb.

1767. WINIESKI, J. A. **Artificial hybridization and grafting methods with *Ulmus americana*.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (48–51).

Reports on a study started at Syracuse University in 1957. An adaptation of von Wettstein's hybridization method, using cut Elm branches in the greenhouse, was successful. A close correlation was found between the time of branch collection and pollination, and between seed production and germination %. Some 264 hybrid seedlings, whose parents had shown more or less resistance to *Ceratocystis ulmi*, were produced and were being grown on for resistance tests after 2 years. In tests of (*a*) bottle, (*b*) side and (*c*) cleft grafting, with a total of 149 grafts, the take was 81, 64 and 50% respectively, though (*a*) required more care after grafting than (*b*) or (*c*). Successful heteroplastic graftings included scions of *U. carpinifolia* and *U. parvifolia* on *U. americana* rootstocks.

1768. KOUTSOTASSIOS, I. Hē kalliergeia tēs *Pistacia vera* (phystikias). **[Cultivation of *Pistacia vera*.]** *Das. Chron.* 2 (18/19), 1960 (847–9). [Gk.]

A short account of the grafting of a few shoots of wild *P. vera* on *P. terebinthus* in E. Thessaly. Scion growth has been outstanding (3 m. long in the 2nd year), and in the 3rd year they have all flowered and set fruit.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also Nos. 1751, 1846.

1769. BRISCOE, C. B. **Lifting Pine seedlings.** *Trop. For. Note Trop. For. Res. Cent., Rio Piedras* No. 3, 1960. pp. 2.

Survival of *Pinus caribaea* seedlings (*a*) potted 4 weeks before planting out, was much higher than that of seedlings lifted (*b*) with earth, or (*c*) bare-rooted, the day before planting out (87·9, 55·4, 45·3% respectively).

1770. FURUTA, T. **Site preparation and container type: effects on growth of round-leaved Japanese Holly.** *Amer. Nurserym.* 112 (9), 1960 (15–6, 127–9). 3 refs.

Temperatures inside the container, and the top and root growth [of *Ilex crenata rotundifolia*], were studied. Growth varied little with the type of base on which the container was standing. High temperatures in the container retarded growth. There was no difference in growth between plants in metal or plastic containers, but light-coloured containers gave better results than dark ones.

1771. LITVINENKO, S. N. Vlijanie gibberellina na sejancy i semena. **[Effect of gibberellin on seeds and seedlings.]** *Lesn. Hoz.* 12 (4), 1960 (81–2). [Russ.]

[Cf. *F.A.* 21 Nos. 3071–2.] An aqueous solution of gibberellin (0·00025%), applied at the rate of one drop per day to the terminal bud of potted *Quercus robur*, *Acer platanoides*, *Tilia cordata*, *Elaeagnus angustifolia*, etc. stimulated height growth and development. Similar results were obtained with sprays on outdoor plants. Soaking in a 0·002% solution for 3 days greatly accelerated the germination of seeds normally requiring stratification.

1772. GUNDERSEN, K. **Some experiments with gibberellic acid.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 22, 1959 (87–110). 21 refs. [E.e.] L.S.

Plants used included *Salix* spp. Gibberellic acid reduced root formation of cuttings of *S. purpurea*, but increased shoot elongation and leaf size.

232.33. Formation of Stands by Direct Sowing

See also No. 1699.

1773. ORLOV, F. B. Letnie posevy hvojnyh na Severe. **[Summer sowings of conifers in the north [of the U.S.S.R.].]** *Lesn. Hoz.* 12 (3), 1960 (24–5). [Russ.]

Seeds of *Pinus sylvestris*, *Picea abies*, and *Larix sukaczewii* were sown broadcast on small tilled patches (2500 patches/ha.) on old clear fellings 200 km. S. of Archangel on (*a*) May 20–27, 1957, (*b*) July 10–20, 1957, and (*c*) Sept. 15–25, 1956. Results, assessed in autumn 1958, were found to be worst for (*c*) with all three species. On medium clay-loams and sandy-loams, (*b*) sowings gave good results, often better than (*a*). On heavy soils, frost heaving was worse for (*b*) than for (*a*) or (*c*). On light soils, it was not a problem. Soaking seed before (*b*) sowings increased the seedling yields and reduced frost heaving.

1774. HERMANN, R. **The influence of seedbed microenvironments upon the establishment of Douglas Fir (*Pseudotsuga menziesii* (Mirb.) Franco) seedlings.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (403–4). O.R.S.

On a clear-felled and burned S. slope in W. Oregon, seedbeds of (*a*) charcoal, (*b*) hard-burned and (*c*) light-burned soil, (*d*) mineral soil, (*e*) litter and (*f*) sawdust, were laid out on 90 plots exposed to full sunlight or lightly or heavily shaded. Temperatures were measured at various points above and below the seedbed surfaces in 1957–58, rainfall was measured from spring 1957 to autumn 1958, and soil moisture at depths of 5 and 15 cm. in the 1957 and '58 growing seasons. Surface temperatures were highest in (*a*) and (*e*) and lowest in (*f*) and (*b*), but differences seldom exceeded 6–10° F. In the summer the uppermost soil layers under (*e*), (*f*) and (*a*) were on average 16–18° cooler than under (*b*), (*c*) and (*d*). Soil moisture was depleted rather uniformly under all types of surface. Sowing with Douglas Fir seed in 1957 failed almost completely because of rodent damage and heat injury. In 1958, after resowing in January, loss of seed to rodents was small and germination was satisfactory, being highest, for all seedbeds, with full exposure to light. The best medium for germination was (*a*) followed by (*b*), probably because of the better preservation of moisture at the surface in these two materials. Seedling losses in 1958 were caused primarily by animal depredations and heat injuries; damping-off, drought and frost were less important. Losses of second-year seedlings in 1959 were insignificant. Losses were lowest under light shade. Heat caused most losses on the exposed seedbeds, and animal depredations on the heavily shaded ones. Seedling numbers at the end of the 1958 and 1959 growing seasons were highest on (*a*) and (*b*), as a result of the original high germination, although survival was best on (*e*) and (*f*). Seedling growth was not clearly related to seedbed conditions.

1775. KRAJICEK, J. E. **Some factors affecting Oak and Black Walnut reproduction.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (631–4). 3 refs. O.R.E.

[Cf. *F.A.* 17 No. 2744.] Studies were made of the effects of screening (to exclude rodents), litter removal, and seed placement on the germination of acorns (Black, Bur, White, and Northern Red Oak) and Black Walnut under even-aged Oak stands. Seed placement strongly influenced seedling production, germination being best if the seeds were in the mineral soil. Litter was not detrimental to Black Walnut germination, but had adverse effects on acorn germination. Without screening, seed losses were complete for Black Walnut, but screening was less important than seed placement and litter removal for the acorns. Differences between aspects and between the 4 Oak species were not significant.

1776. BUDOWSKI, G. Siembra directa de "laurel" *Cordia alliodora* sobre montoncitos incinerados. **[Direct sowing of *C. alliodora* on burned mounds.]** *Comun. cient. agríc. Inst. Interamer. Cienc. Agríc., Turrialba* (*Dasonomía*) Hoja No. 12, 1960. pp. 2. [Span.]

Gives results of the trial [see *F.A.* 22 No. 466] to 1960. There is no doubt that the method is suitable for establishing *C. alliodora* by direct sowing, but the grass *Melinis minutiflora*, if prevalent, checks it and causes some mortality. Growth of *C. alliodora* was not so good on steeper slopes.

232.4. Formation of Stands by Planting

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 1715, 1749, 1769, 1792, 1794, 1883.

1777. NOVOTNÝ, M. Ekonomické zhodnocení normy "Sazenice lesních dřevin". **[Economic assessment of the [Czech] standard on "Seedlings of forest trees."]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (141–54). 2 refs. [Cz.russ.g.]

Analysis of data shows that the standard on tree seedling quality (ČSN 482211) is effective, and its application economically sound.

1778. SILKER, T. H. **Economic considerations of growing and grading Southern Pine nursery stock.** *Tree Plant. Notes* No. 42, 1960 (13–8). 2 refs.

Data from 10-year studies by the Texas Forest Service indicate that nurseries should concentrate on growing medium-sized seedlings, with ⩾50% of live crown bearing fascicled needles. It is estimated that the better growth of such planting stock would give $164/acre advantage over small stock at 11 years. Very large seedlings tend towards extreme branchiness and susceptibility to rust.

1779. OSTERMANN-HALSTENBEK. Die verlängerte Pflanzzeit. **[Extended planting periods.]** *Ber. Tag. Nordwestdtsch. Forstver., Kiel 1959*, [1960] (70–5). [G.]

Describes the successful transplanting or planting out in late spring or late summer, of seedlings or transplants of various conifers, broadleaved trees, and shrubs, including many exotics, after periods of cold storage at −2 to −8° C. lasting from 105 days to a full year. In this way it was possible to preserve surplus planting stock for the next growing season and also to spread the work load by lifting plants in the slack season.

1780. WYCOFF, H. **Refrigerated storage of nursery stock.** *Tree Plant. Notes* No. 42, 1960 (32–2). 6 refs.

Describes the methods used at the Mason State Forest Tree Nursery, Topeka, Ill., for over-winter storage of conifer stock.

1781. LANQUIST, K. B., and DOLL, J. H. **Effect of polyethylene and regular packing methods on Ponderosa Pine and Douglas Fir seedlings stored**

over winter. *Tree Plant. Notes* No. 42, 1960 (29–30). 3 refs.

Tests showed that seedlings packed in polythene bags, with no packing material, could be stored for ca. 6 months in a cold-storage plant (33–34° F., r.h. ca. 92%) without noticeable adverse effects on survival or vigour after planting. Care must be taken to avoid undue exposure to heat, the danger of which is greater for bag-packed trees than for those in standard packages.

1782. DAŠKEVIČ, M. D. Ne ostavljat′ otkrytymi korni sejancev. [**Don't leave roots of seedlings exposed**.] *Lesn. Hoz.* 12 (4), 1960 (79–80). [Russ.]

One-year seedlings of *Pinus sylvestris* had their roots bared to the air for 2, 5, 10, 20, 40 and 80 min. under five different sets of conditions: (*a*) on a cloudy day, temperature + 9° C.; (*b*) the same day as (*a*), 10°; (*c*) the same day as (*a*), 12°; (*d*) a rainy day, 16°; and (*e*) a hot clear day, 23°. The roots were then moistened, and the stock planted immediately. Baring the roots for only 2 min. caused 40–80% mortality even under (*a*) conditions, and it is concluded that exposing the roots of seedlings to the air before transplanting should be avoided at all costs.

1783. DASKEVITSH [DAŠKEVIČ], M. D. **Don't leave roots of seedlings exposed**. Oregon Forest Research Center, Corvallis. 1960. pp. 2. An abridged transl. by F. Kudrjavcev from *Lesn. Hoz.* 12 (4), 1960 (79–80).

See preceding abstr.

1784. JOBLING, J. **Experiments on the handling of Poplar planting stock**. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (161–7).

A series of experiments was started in 1953 to see how far bad handling of Poplar plants contributed to losses after planting. The practical conclusions are that root exposure, up to 40 days in January/February, does not affect survival after planting, though it may cause some crown dieback and early reduction in growth, which is, however, quite temporary. Root severance at time of lifting also has no appreciable effect on survival or rate of growth. It was found that the tolerance of Poplar plants to various forms of root damage during handling is similar for different ages and types of nursery stock and for different varieties. This knowledge, however, should not be construed as permitting deliberate or careless mis-handling of nursery stock.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 1699–1700, 1728, 1734, 1792, 1794.

1785. TROUSDELL, K. B. **Forest planting practices are often ineffective**. *J. For.* 58 (9), 1960 (718–9). 1 ref.

In view of the need to make best use of the seedlings from seed-orchard sources that will soon be available, the differences in % effective planted seedlings per acre with best and worst practices are demonstrated from previously published data [cf. *F.A.* 21 No. 1642].

1786. EDWARDS, M. V. **Effects of different forms and amounts of basic slag and mineral phosphate on the growth of Japanese Larch planted on blanket bog**. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (111–25). 4 refs.

Reports the results of an experiment laid down in 1937, comparing four forms of P fertilizer, (1) high-grade, high-soluble basic slag, (2) high-grade medium-soluble ditto, (3) low-grade high-soluble ditto, and (4) mineral phosphate, each applied at 3 dosages, (*a*) 1 oz., (*b*) 2 oz., (3) 4 oz./plant, at the time of planting Japanese Larch on blanket bog in Inverness-shire. Untreated controls were included. The main results were that, though the different forms gave slightly different growth responses for equivalent amounts of fertilizer—(3) being the least efficient in this respect—the major growth effects corresponded with the total amount of fertilizer applied per plant, regardless of the form applied. The controls grew slowly (6·2 ft. in 13 years) while heights for (*a*), (*b*), and (*c*) averaged 14·1, 16·5, and 19·0 ft. respectively at the same age.

1787. DUCHAUFOUR, P., and TURPIN, P. Essais de fertilisation sur humus brut contrôlés par l'analyse foliaire sur pin sylvestre et épicéa. [**Fertilizer trials on raw humus checked by foliar analysis of Scots Pine and Norway Spruce**.] *Ann. Éc. Eaux For., Nancy.* 17 (2), 1960 (209–33). 18 refs. [F.f.e.g.]

The experiments were made with Pine and Spruce seedlings raised and planted out, at 500/sq. m., on a mor humus, pH 3·8, C/N ratio 36. The four treatments (replicated twice for each species and applied before planting out) were: (*a*) control, (*b*) injection of gaseous NH_3, (*c*) application of 500 g. of basic slag + 250 g. $(NH_4)_2SO_4$ per 100 kg. moist humus, and (*d*) as (*c*) but with the addition of 1·1 kg. of $CaCO_3$ per 100 kg. moist humus. Nutritional status of seedlings was determined by foliar analysis in April and November of the year after planting (in the previous autumn), and finally a complete analysis was made of an average seedling from each treatment. The following results were obtained. In (*a*) plots, which had been cultivated before planting, it was found that the simple mechanical treatment had stimulated a favourable development of the humus, with an increase in pH values and in content of exchangeable bases; Pine did well, but Spruce showed a slight N deficiency in the first year, which was corrected after planting out. Treatment (*b*) was followed by large-scale damping-off of seedlings and nutritional imbalance, plus loss of bases and humic acids by leaching in the first year; by the end of the second year the pH had fallen again to 4·2, and the reserves of exchangeable NH_3 were exhausted. The most favourable results were obtained from (*c*), the final pH value of 5 appearing to be the optimum; Spruce made better use of the fertilizers (especially P) than Pine. The enrichment of the soil with NH_3, though useful in the first year, was not lasting, and seedlings were less well provided with N than controls in the second year. The use of Ca to neutralize the soil in (*d*) did more harm than good; losses of available N by gaseous exchange or biological fixation were immediate and severe, and excessive uptake of Ca appeared to be at the expense of uptake of Mg. At pH 7·1, a marked deficiency in Mg resulted in marked yellowing of needles and reduction in increment.

1788. BRISCOE, C. B. **Early results of mycorrhizal inoculation of Pine in Puerto Rico.** *Carib. For.* 20 (3/4), 1959 (73–7).

After many failures in introducing Pines to the island, involving 27 species (listed), small-scale trials of *Pinus elliottii* var. *elliottii* treated, two years after planting out, with a soil inoculation from a *P. taeda*/*P. echinata* stand in N. Carolina, were highly promising. Survival over 4 years was 85% against 36% for controls, with height growth >13 times that of controls. Satisfactory survival and early growth were also obtained with 1-year-old mycorrhizal *P. elliottii* var. *elliottii* seedlings imported by air from Mississippi and with Cuban and British Honduras seed of *P. caribaea* grown in soil inoculated with soil from a *P. virginiana* stand.

1789. LISJUTIN, V. P. Prisposoblenie dlja posadki v plast. **[A device for planting on the furrow slice.]** *Lesn. Hoz.* 12 (5), 1960 (63). [Russ.]

Describes a machine designed by VNIILM for planting seedlings on the furrow slice as it is thrown up by a mouldboard plough. It incorporates a plate to press the slice down in contact with the soil surface, a share to make the planting slit, and the planting mechanism itself, which is fed with plants by a worker seated on the unit.

1790. SAATÇIOĞLU, F. Belgrad ormanında çeşitli aletlerle yapılan meşe dikimlerine ait denemeler ve sonuçları. **[Oak planting trials with various planting tools in the Belgrad forest [Turkey].]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (1–10). 6 refs. [Turk.g.g.]

Compares cost and speed of planting, and seedling survival, with a conventional forest spade and three types of borer. Planting costs with the borers were <½ those with the conventional spade, but mortality was higher.

1791. DUNLOP, R. H. **Note on a mechanical tree planter for shelterbelts.** *Canad. J. Pl. Sci.* 40 (3), 1960 (568–9 + 4 photos). O.R.E.

Describes and illustrates the machine, which is specially designed for planting deciduous and coniferous seedlings in the Prairie Provinces and has worked successfully under rough conditions during the last 5 years. Two operators feed the plants to the planting mechanism. Speed of work is ca. 1 mile/hr.

232.43. Spacing and Arrangement in Plantations

See Nos. 1581, 1811, 1883.

232.44. Season and Time of Planting

See also No. 1779.

1792. BARTHOS, T. Fenyőcsemeték nyári ültetése. **[Summer planting of coniferous seedlings.]** *Erdő* 6 (8), 1957 (315–7). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (1), 1958 (12). [E.] C.G.B.

Seedlings sown in spring in near-by temporary nurseries are planted out the following August/September in auger-made holes. The new growth put on before winter makes for less frost-heaving, and production generally surpasses that of spring and autumn planting. Survival is frequently 91%, sometimes even 98%.

1793. SOULĒS, B. Phthinopōrinē hē earinē phyteia tēs Eurамerikanikēs leukēs. **[Autumn or spring planting of [stumps of] Euramerican Poplar.]** *Das. Chron.* 2 (20/21), 1960 (885–9). [Gk.]

Recent small-scale experiments indicate that autumn planting (November 21) gives more vigorous growth than spring (March 10). Results of one year are tabulated.

233. Afforestation

See also Nos. 1377–9, 1621, 2608–9, 2634.

1794. ZEHETMAYR, J. W. L. **Afforestation of upland heaths.** *Bull. For. Comm., Lond.* No. 32, 1960. pp. 145 + 34 photos. 55 refs. Price 17*s.* 6*d.*

The upland heaths considered comprise wide stretches of heather-clad land among the hills along the E. side of Scotland and N. England. They are distinct from the peat-covered lands situated further west, which were dealt with in an earlier bulletin [see *F.A.* 16 No. 1698]. The present bulletin reviews all the experimental work carried out over a period of 36 years. Many methods tried in the early years have been discarded, while others have become general practice. It contains the following chapters: (1) The characteristics of upland heaths; (2) Comparison with other W. European heaths; (3) The upland heath forests and experimental areas; (4) Planting with preparation of the ground by hand; (5) Ploughing; (6) The main species used on the heaths [Scots and Lodgepole Pines; European, Japanese and hybrid Larches; Sitka Spruce]; (7) Trials of the species less widely used on the heaths; (8) Manuring at planting; (9) Nurse crops and the establishment of mixtures; (10) The stimulation of checked plantations and investigations into the "Spruce/Heather" relationship; (11) Trial plantations; (12) Other experiments.

1795. MARSHALL, I. R. **Afforestation on the chalk wolds of East Riding of Yorkshire.** *Quart. J. For.* 54 (4), 1960 (338–44). 2 refs.

Records investigations comparing conditions on the Yorkshire wolds with the chalk downlands of S.E. England. The importance of soil, aspect, and vegetation is defined, and recommendations given for cultivation, treatment, and choice of species. Data have been obtained from Scardale and Londesborough forests, and from private estates as well as from several forests in Sussex. *From author's summary.*

1796. WILLIAMSON, J. Q. **Afforestation of industrial waste.** *Nature, Lond.* 188 (4744), 1960 (11–2).

Summarizes a symposium held in Sub-section V of the British Association on 2 Sept. 1960 at Cardiff. Papers were read by *J. Q. Williamson* on the work of the Forestry Commission, Gt. Britain, in this field, by *J. Casson* on work by the Lancashire County Council, and by *J. W. Houldsworth* on large-scale afforestation of ironstone workings in Northamptonshire.

1797. Stachy, J. Zadrzewianie hałd powęglowych w Niemieckiej Republice Demokratycznej. **[Afforestation of coal-mine spoil-mounds in E. Germany.]** *Sylwan* 104 (8), 1960 (35–44). 3 refs. [Pol.]

An account of experience at two sites, Laubusch (since 1949) and Möhlau (since 1926), mainly with Poplars.

1798. Matolcsy, A. A pilisvörösvári dolomitkopár üzemi erdösítésének leírása. **[Economical reforestation in the dolomitic derelict land of the Pilisvörösvár.]** *Erdö* 7 (9), 1958 (343–9). [Hu.g. russ.]

Describes 6 years' experience of reforestation and gulley plugging in the Pilis division, where are 5000 of Hungary's 150,000 ha. of waste lands. Contour strips are cultivated, terraced, and line-sown with Pine or planted with broadleaved species. The Pine is thinned with shears to 5- to 6-cm. spacing in the second year.

1799. Horváth, L. Homoktalajok víztartalma és az árkos ültetés. **[The water content of sandy soils and planting in trenches.]** *Erdö* 7 (1), 1958 (22–7). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (8). [E.] C.G.B.

Recommends, for sands where a July–Aug. m.c. of 2–2·5% is limiting, trenches 60–70 cm. deep and 50–60 cm. wide, running E.-W. with a larger bank on the S. side, prepared by double ploughing the year before planting. Merits lie in better microclimate and moisture; protection against white grub; check on 1st-year weeds; and accumulation of snow, which provides both protection from game and water storage against a dry spring. Plantation survivals have been 97%.

1800. Bušs, M. Kalnu priedes noderīgums kāpu smiltāja apmežošanai. **[The suitability of *Pinus mugo* for afforesting sand dunes.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (73–81). 6 refs. [Latv.russ.] N.L.L.

Studies in 22-year-old plantations near Riga, both pure and in mixture with *P. sylvestris*, showed that mean height, crown projection, and crown volume were much less in *P. mugo* than in *P. sylvestris*. Most of the *P. mugo* formed low bushes with virtually no ground vegetation between them, and the root system was poor.

1801. Kāposts, V. Augiem nepieciešama barības vielu saturs un dinamika Latvijas PSR smiltājos 1956. gada veģetacijas periodā. **[Contents of and changes in nutrients in Latvian sands in the 1956 growing season.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (61–71). 16 refs. [Latv.russ.] N.L.L.

Analyses the position as regards N, P, and K, to explain the failure or success of Scots Pine plantations on sand dunes. In general there was a shortage of N and K, and in some places of P also. Pine grew well only on richer sands, or on sands with a buried layer of soil with humus.

1802. Kith Tassara, M. Solución al problema de regeneración de los terrenos de arenas sueltas (dunas), en la zona SO. de España. **[Solution to the problem of afforestation of areas of loose sand (dunes) in southwestern Spain.]** In *Conferencias sobre erosión y conservación del suelo.* Sección de Publicaciones de la Escuela Especial de Ingenieros de Montes, Madrid. 1956. pp. 67–74. [Span.]

Reviews briefly the origin of sand dunes and the fixation methods used in the Landes of France, and describes those used in S.W. Spain. These include brushwood fences above high-tide level, spreading brushwood (20,000–30,000 kg./ha.) over existing dunes and sowing among it Pine, *Retama monosperma*, and other shrubby species. During the last 14 years an annual average of 132 ha. of dune has been fixed in this way. Some special cases are discussed where the procedure has been modified.

1803. Fedorko, A. A. Oblesenie namyvnyh kos. **[Afforesting alluvial spits.]** *Lesn. Hoz.* 12 (9), 1960 (37–40). [Russ.]

A general account of work on one of the spits off the N. coast of the Sea of Azov, where the soil layers are: fine sand (15 cm.), fine sand + broken shells (30 cm.), fine sand (10 cm.), large shells (35 cm.), large shells with fresh water (50 cm.), and below that, salty groundwater (sea-water). The best results have been with *Robinia pseudoacacia*, *Populus × 'canadensis'*, *P. tacamahaca*, *Fraxinus excelsior*, *Sophora japonica*, *Morus alba*, *Salix acutifolia* var. *caspica*, *S. babylonica* and *Elaeagnus angustifolia*.

1804. Ullah, C. I., and Sheikh, M. I. **Afforestation campaign under the Thal Development Authority**. *Pakistan J. For.* 10 (2), 1960 (117–26). 2 refs.

Describes the work done since ca. 1936 in stabilizing and afforesting (mainly with *Dalbergia sissoo*) this large area of shifting sands in W. Pakistan, and future projects.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 1555, 1952.

1805. Chenal, E.-L. Enrésinement des hêtraies de basse montagne: observations faites dans les Vosges à la suite de la sécheresse 1959–1960. **[The introduction of conifers in the sub-montane Beech forest: observations made in the Vosges after the drought of 1959–60.]** *Rev. for. franç.* 12 (10), 1960 (643–5). [F.]

On the whole the conifers (Silver Fir, Scots Pine, and Norway Spruce) showed little damage. In general it is concluded, however, that conifers should be released early and that it is illusory to hope to grow them as an understorey under broadleaved species.

1806. Rafael García, J., and Miguel Ravago, C. La tara amarilla como pionera en la reforestiacón. **[*Oyedaea verbesinoides* as a pioneer**

in reforestation.] *Agric. venez.* 24 (218), 1960 (28–33). [Span.]

Trials in the artificial regeneration of *O. verbesinoides* on poor grassland in the Macarao basin, Venezuela, were cut short by fire. The preliminary results, however, showed that *O. verbesinoides* is a suitable pioneer for poor sites exposed to strong insolation, and that the seed will germinate and grow on soil that has been cleared of grass and forked over.

1807. Kaldy, J. A rezgönyár csemelenevelése és jelentösége hegyvidéki erdeinkben. **[Plant production and the role of Aspen in our mountain forests.]** *Erdö* 7 (12), 1958 (446–55). 9 refs. [Hu. russ.g.]

Recommends the planting at 4 × 4 m. of Aspen in Beech and Beech/Oak stands at the thicket stage for felling later as a catch crop. A method of seed collection and plant raising, successfully followed for 4 years, is described.

1808. Babos, I. Homoki akácelegyes állományok. **[Stands mixed with Black Locust on sandy soils.]** *Erdö* 6 (10), 1957 (361–71). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (10). [E.] C.G.B.

Proposes, with supporting Hungarian evidence, that on good sites *R. pseudoacacia* should share the overstorey with fast growers, e.g. Poplars, and have a Hornbeam understorey. On poor sites, only species biologically suited e.g. *Pinus nigra* var. *austriaca* should be mixed with it and then stem-by-stem to benefit from the N fixation.

1809. Mosin, V. I. Akacija želtaja—plohoj sosed dlja sosny. **[*Caragana arborescens*—a bad associate for *Pinus sylvestris*.]** *Lesn. Hoz.* 12 (8), 1960 (35). [Russ.]

Studies were made in plantations in N. Kazakhstan, established in 1941–54, and consisting of: (*a*) alternate rows of Pine and *C. arborescens*, (*b*) 4 rows Pine, 1 row *C. arborescens*, and (*c*) 4 rows Pine, 1 row *C. arborescens*, 2 rows Birch, 1 row *C. arborescens*. The distance between the rows was generally 1·5 m. It was found that *C. arborescens* dried out the soil too much, and that its crown and height growth were so vigorous as to shade out the Pine in adjacent rows.

1810. Naumenko, E. N. O povyšenii biologičeskoj ustojčivosti sosnovyh kul′tur Buzulukskogo bora. **[Increasing the vitality of Scots Pine plantations in the Buzuluk Pine forest.]** *Lesn. Hoz.* 12 (10), 1960 (32–9). 1 ref. [Russ.]

On the basis of investigations in plantations established in 1915, it is concluded that the planting of rows of Birch in Pine plantations greatly improves the performance of the Pine. Two rows of Birch to five of Pine are recommended, with the Pines 0·4–0·5 m. apart in the rows and the Birch 0·6–0·7 m., and 1·5 m. between rows. Plantations so arranged will have 77% Pine and 23% Birch. On certain sites, a row of soil-protecting shrubs may be planted as a buffer between the Pine and the Birch. To increase stand productivity, the Birch should be felled at ≯35 years, and allowed to coppice, so giving a second harvest.

1811. Pogrebnjak, P. S. Povyšenie produktivnosti lesov putem sozdanija smešannyh nasaždenij. **[Creation of mixed stands as a means of raising forest yields.]** In *Voprosy lesovedenija i lesovodstva.* Moscow. 1960. pp. 95–112. [Russ.E.]

Expounds the advantages of mixtures, and discusses *Fraxinus excelsior*/*Larix sibirica* and *Alnus glutinosa*/*Populus* × '*canadensis*', mixtures which have done exceptionally well in the Ukraine. The author proposes a so-called "poly-chessboard" design for trial plantings for the study of a large number of species interactions on a small area. This design is illustrated for 10 species (10 plots of each) on 1 ha., the plots being so arranged that each species adjoins each of the others four times. It is thought that this technique will assist in the determination of suitable species-mixtures.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also No. 1700.

1812. Polosuhin, G. G., and Timošenko, V. L. Mehanizirovannyj sposob obrabotki počvy v rjadah lesopolos. **[Mechanized tillage between and within the rows in [young] shelterbelts.]** *Lesn. Hoz.* 12 (7), 1960 (58–61). [Russ.]

Describes modified versions of cultivator attachments already described [see *F.A.* 20 Nos. 3149, 3152].

1813. Bjarnason, H. Skjólgrindur. **[A fence for use as a windbreak.]** *Extr.* from *Ársr. Skógræktarf. Íslands 1959*, 1960 (33–5). [Ice.]

Describes an easily and cheaply made fence of wooden slats to protect young conifers by reducing the risk of drying out after transplanting.

1814. Wood, A. S. **Staking forest trees.** *Quart. J. For.* 54 (4), 1960 (368–9).

After experimenting for some years with various methods of attaching young trees to stakes with binder twine, proofed yarn, and tarred string, and finding none of these satisfactory because of damage to the bark by friction, the author adopted the idea of using rubber bands cut from scrap tractor inner tubes and found them perfectly satisfactory. The method of cutting 2-in.-wide strips and fixing them is described.

1815. Wyatt-Smith, J. **Diagnostic linear sampling of regeneration.** *Malay. Forester* 23 (3), 1960 (191–208). 2 refs.

[Cf. *F.A.* 19 No. 4164.] Details are given of the few cases where the first two of the 3 series of diagnostic sampling have been carried out over the same forest, managed under the Malayan uniform system. Tabulated comparative data are given for seedling and sapling sampling (with 5 years' interval) in the same compartments.

237. Amelioration of Forest Sites

See also Nos. 1361, 1560, 1734, 1786–7, 1794, 1883.

1816. Krapfenbauer, A. Vergleichende Standortsuntersuchung als Hilfsmittel zur Beurteilung forstlicher Standorte bezüglich der Durchführung von Meliorationen. **[Comparative site analysis as an aid in planning amelioration of forest sites.]** *Cbl. ges. Forstw.* 77 (3), 1960 (155–69). 15 refs. [G.g.]

Gives an example in which the plans for fertilizing and species conversion of a degraded site (*a*), carrying poor Spruce and Pine, are based on conditions of a near-by site (*b*), carrying Beech, Silver Fir and Spruce, thought to represent the same site-type undisturbed. Contents of CaO, MgO and P_2O_5 in the secondary podzol of (*a*) were ca. 10% or less of those in the brown forest soil of (*b*), total N was markedly less and C markedly more.

1817. Heiberg, S. O., and Leaf, A. L. **The effect of forest debris on the amelioration of sandy soils.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2*A*, 1959 (14). O.B.D.

A comparison was made of the growth of *Pinus resinosa*, *P. strobus*, *Picea glauca* and *P. abies* on untreated soils and soils treated 25 years before with humus and slash, and of the composition of the soils and foliage. The source of the slash and humus, e.g. from highly productive or from poor sites, affects the ameliorative values of the organic matter. Growth of *P. resinosa* on a control plot mulched with glass wool indicated that the increased fertility due to the organic additions greatly exceeded the purely mulching value of humus and slash.

1818. Mergen, F., and Voigt, G. K. **Effects of fertilizer applications on two generations of Slash Pine.** *Proc. Soil Sci. Soc. Amer.* 24 (5), 1960 (407–9). 13 refs.

A series of 37 plots was established on which three formulations of fertilizer were applied at five rates to two age-classes of Slash Pine growing in Florida. The fertilizer caused increases in the nutrient contents of needles and branches of the younger trees and of cones and seeds in the older trees. B.a. growth was increased as much as 32% in the older trees. Fertilizer treatments had no significant effect on cone length but produced heavier seeds. Germinated in the green-house, these seeds produced larger and more vigorous seedlings with higher contents of N, P, and K than did seeds produced on control trees. *From authors' abstract.*

1819. Wood, R. F., and Holmes, G. D. **Silvicultural investigations in the forest: (A) South and Central England and Wales. Improvement of checked plantations.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (33–5).

[Cf. *F.A.* 20 No. 4548.] Manurial experiments on a number of checked sites have continued, and confirm that, in nearly all cases, phosphate dressings provide the remedy. In some cases heavy dressings of 6 oz. or more per plant are necessary to produce a prolonged growth response. In heather-infested areas, Spruces suffer from N deficiency, and dressings of Nitrochalk at 45–225 lb./acre produce temporary responses lasting 1–2 years. A search is being made for more persistent forms of N fertilizers.

1820. Themlitz, R. Umsetzung von Kalkstickstoff und einigen seiner Zersetzungsprodukte sowie von Harnstoffharz mit einem Fichtenrohhumus. **[Decomposition of $CaCN_2$ and some of its breakdown products and of a urea-resin compound in a Spruce raw humus.]** *Landwirtschaftliche Forschung, Frankfurt am Main* 11 (4), 1958 (230–5). 7 refs. [G.g.e.f.] C.G.B.

Tabulates the amount of N present in various forms (in % of organic matter) 76 days after raw humus (*A*) untreated (pH 3·2, 2% N), and (*B*) already improved with CaO and $CaCN_2$ (pH 6·4, 2·37% N) had been treated, at rates of 0·4 and 0·8% N, with $CaCN_2$ (*a*), its normal breakdown products NH_3 (*b*) and urea (*c*), its potential intermediate products dicyandiamide (*d*) and guanyl urea (*e*) and a urea resin compound (*f*). Only (*a*) raised pH appreciably in both media; (*b*), (*c*), (*e*) and (*f*) even lowered it in (*B*). In (*A*), (*a*), (*b*), (*c*) and (*f*) produce chiefly NH_3-N, in (*B*), NO_3-N; both (*d*) and (*c*) were inactive in (*A*) and (*d*) slow in (*B*). A much higher % of (*a*) and (*f*) than of (*b*), (*c*), (*d*) and (*e*) was fixed in non-hydrolysable form. Hence the hypothesis that (*d*) and (*e*) contributed to the greater N fixation in stable form from (*a*) than from (*b*) [cf. *F.A.* 19 No. 416; *F.A.* 21 No. 473] was not borne out. It is thought that the form of application of (*a*) and (*f*)—they were finely powdered, whereas the others were in solution—may have created favourable conditions for N fixation.

1821. Themlitz, R., and Wandt, H. Kalidüngung zu Lärchen. **[K fertilizing of Larch.]** *Allg. Forstzeitschr.* 15 (45), 1960 (643–5). 7 refs. [G.g.]

On poor, acid, alluvial sands near Meppen, Lower Saxony, needles of Larch [unspecified] contained more Mg, K, P and N, and less Ca than Pine needles. Fertilizing with N, P, K, Mg and marl affected only the K content considerably, raising it from 0·48 to 0·72% in Pine and from 0·96 to 2·21% in Larch. In another trial, K_2SO_4 + $MgSO_4$ at 400 kg./ha. significantly increased growth (particularly on a moister site) of two-year-old Japanese Larch 3 and 4 years after planting on similar soils that had received similar balanced fertilizers. On the drier site, drought losses in 1959 were 7·7% on the K plot vs. 16·7% on the control.

1822. Knjazeva, L. A. Vlijanie mineral′nyh udobrenij i mikroèlementov na guttaperčenakoplenie i rost bereskleta evropejskogo. **[Effect of mineral fertilizers and trace elements on the accumulation of gutta percha and on growth of *Euonymus europaeus*.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (129–48). 44 refs. [Russ.russ.]

Application of mineral fertilizers, especially NPK, increased the growth of *E. europaeus* on sandy soil; application of Fe and B also improved growth, but Cu and Zn reduced it. N (as nitrate), KCl, Fe, and B, all brought about an increase in gutta accumulation. Freezing of the leading shoots every year in the Moscow region does not limit the introduction of the species there. Mineral fertilizing improves fruiting and seed quality. [Cf. *F.A.* 21 No. 3884.]

1823. Gericke, S., and Bärmann, C. Gemeinsame Kalk- und Phosphatdüngung im Forst. **[Simultaneous application of lime and phosphate in the forest.]** *Phosphorsäure, Essen* 18, 1958 (227–31).

[G.] From *abstr.* in *Soils & Fertil.* 22 (2), 1959 No.) 789).

Describes the simultaneous application of ground limestone and basic slag through a blower generally used for the distribution of lime.

1824. **Nutrition [Aerial application of nutrients.]** *Extr.* from *Rep. Wds. For. Dep. S. Aust. 1957/58*, 1959 (13).

Spraying of $ZnSO_4$ 20% solution at 3 gal./acre was done from the air on a large scale, following pilot trials, and preliminary observations indicate favourable results. Further experiments with other nutrients are being made.

1825. STOUT, B. B. **Supplemental irrigation of 75-year-old hardwoods.** *Black Rock For. Pap.* No. 25, 1959. pp. 5. 15 refs.

In mixed hardwood stands aged 75 years, mean b.a. 55·3 sq. ft./acre, near West Point, N.Y. (annual rainfall 41 in., mean weekly summer rainfall 0·89 in.), b.a. increment was compared for 3 years between (*a*) plots that had been cleaned of all undergrowth by cutting and spraying, (*b*) a plot that, in addition, had received 1 in. of water, whenever rainfall in a week was $<\frac{1}{2}$ in., and (*c*) controls with 2–3 years' undergrowth ca. 10 ft. high. Though b.a. increment in % of b.a./acre was slightly higher in (*b*) than in (*a*), the difference was not significant. But the difference between (*b*) and (*c*) was significant, and that between (*a*) and (*c*) nearly so, suggesting that competition from undergrowth was an important factor.

1826. SABO, E. D. Opredelenie ploščadi vodosbora pri limannom orošenii drevesnyh nasaždenij. **[Determining the catchment [area necessary] for spring-flood irrigation of tree stands.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (149–150). [Russ.]

From studies in the Ergeni Hills, constructs a table showing the catchment area (ha.) necessary for spring-flood irrigation of 1 ha. of plantation by run-off water, taking into account the slope of the catchment, the amount of precipitation (snow), and the amount of irrigation water to be applied.

1827. HARITONOVA, R. G. Nekotorye ėlementy rasčeta pri ustrojstve melkovodnyh limanov dlja orošenija polezaščitnyh lesnyh polos. **[Some bases for calculating and arranging shallow spring-flood irrigation for irrigating shelterbelts.]** *Izv. Timirjaz. Sel.'hoz. Akad., Moskva* 1960 (4), (114–26). 5 refs. [Russ.e.] O.W.

[Cf. *F.A.* 21 No. 1778.] Presents calculations on the amount of water to be applied in spring-flood irrigation; the amount of spring run-off and its availability; the catchment area necessary to irrigate 1 ha. of shelterbelt; and soil-water supplies provided by spring-flood irrigation, and its utilization by the trees.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 2251, 2324.

1828. Numero speciale dedicata alla coltura accelerata delle conifere a rapido incremento. **[Special number devoted to the 'accelerated cultivation' of fast-growing conifers.]** *Monti e Boschi* 11 (7/8), 1960 (293–428). [It.]

[Cf. *F.A.* 20 No. 364.] By 'accelerated cultivation' is meant the growing of trees as a relatively short-term crop, without any regard to the traditional concepts of silviculture (e.g. the forest, rotation, regeneration), as in most of the Poplar-growing on the continent. Experiments are now in progress in Italy on similar treatment of conifers, and the present special number is devoted to these experiments, including the following articles: (I) General principles of accelerated cultivation of fast-growing woody plants (*G. Piccarolo*). (II) Climatic data for the Po valley and preliminary studies of certain soils in relation to the introduction of accelerated cultivation: (1) Ecological requirements of *Pinus strobus*, *Pseudotsuga taxifolia*, and *Larix leptolepis* (*G. P. Mondino*), (2) General characters of some soils suited to *Pinus strobus* (*A. Giordano*). (III) Observations on some sites of fast-growing conifers and their interest for the improvement of accelerated cultivation: (1) Sub-spontaneous sites of *P. strobus* in Piedmont (*G. P. Mondino* and *E. de V. Pellati*), (2) Possibilities and limits of *Chamaecyparis lawsoniana* in the province of Udine (*A. Stefanelli*), (3) Criteria for breeding tree species for accelerated cultivation, and the organization of field trials (*W. Vivani*). (IV) Basic principles of propagation: (1) Seedbeds (*G. Bressy*), (2) Transplant lines (*A. Baridon*), (3) Planting out in the field (*A. Baridon*), (4) Tending (*A. Baridon*). (V) Pests of *P. strobus* and some other fast-growing conifers in Piedmont: (1) Nursery diseases (*B. Fassi*), *Cronartium ribicola* blister rust of *P. strobus* (*B. Fassi*), Some insect pests (*W. Vivani*); Some data on yield regulation and social and economic budgeting (*G. Piccarolo*).

1829. Hai leukophyteiai tēs Makedonias. Statistika stoicheia dia tēn paragōgēn xyleias. **[The Poplar plantations of [Greek] Macedonia. Statistical data on wood production.]** *Das. Chron.* 2 (22/23), 1960 (1012–4). [Gk.]

Begun in 1935 on the earthworks thrown up along the flood-plain of the Strymon, these have become the pride of the forest service and an increasingly important source of revenue. A recent enumeration provides data on age classes (1–12 in 2-year classes, and 19–20 years) and the total number of trees in each, in the three localities (Serrai, Drama and Thessalonica) and the outturn of timber and fuelwood forecast between 1960 and 1977. By 1966 an outturn of 180,000 cu. m. of timber is expected, i.e. half the current annual outturn from the natural forests of Greece, and 400,000 cu. m. 10 years later.

24. Tending of Stands and Trees

See also No. 1828.

242. Thinning

See also Nos. 1321, 1646, 1852, 1858, 1901–4, 2247.

1830. DITTMAR, O. Untersuchungen über die Eignung der Becking-Zahl zur zahlenmässigen Festlegung des Durchforstungsgrades auf langfristigen Kiefern-Durchforstungsreihen. **[The suitability of the Becking count for the numerical definition of thinning grade in long-term Pine thinning trials.]**

Arch. Forstw. 9 (3), 1960 (266–83). 9 refs. [G.g. russ.e.]

The 'Becking count' for numerical definition of thinning grade is based on the number of trees and the height of the tallest tree in each 10 × 10-m. square of a thinning plot. The mean spacing so derived (read from tables based on a triangular spacing formula) is expressed in relation to the mean top height as a %, viz. 16, 19, 22, 25, the intervals between grades being 3%. To test the applicability of the method, data from 5 thinning series in N.E. Germany, covering A-C grades, fast growth, moderate crown thinnings and increment felling (*Lichtung*) were studied with the following conclusions. Over 50 years' experience of the German Research Stations' 1902 instructions show that they do not provide an unequivocally definite differentiation of thinning grade. Developing Köhler's line of thought, Hart and Becking [see Assman, *F.A.* 21 No. 4387] have provided an objective criterion based on stem count. In order to avoid errors due to site, the mean top height of the whole thinning series should replace that of single plots, which can show differences almost equal to the 3% allowed for grades. The triangular spacing formula involves an error that increases systematically with thinning intensity. Spacing is best calculated on square arrangement. Becking's method is inapplicable to crown thinnings, unless the upper and lower canopy are treated separately. Between the 'Becking count' and Assman's "natural stocking grade" (based on the mean b.a. of the stand during the last thinning interval, that of Grade 1 being 1·000, those of the others decimal fractions of this), there is a strict dependence independent of (height) site index but in close correlation with age. Eliminating age, the partial correlation coefficient of this is −0·8815. The relation of the 'Becking count' to mean b.a. is very slight, excessively overshadowed as it is by thinning grade and age. In general, the study underlines the great importance of Assman's idea of 'natural stocking grade' as a biological datum, and because of the close correlation between this and the 'Becking count' the latter is considered an extraordinarily practical device for controlling thinnings on a numerical basis.

1831. Zviedris, A., Matuzanis, J., and Sacenieks, R. Kopšanas cirtes Latvijas PSR mežos. **[Thinnings in Latvia.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (125–67). 45 refs. [Latv. russ.] N.L.L.

Analyses the diameter increment of trees in thinned and unthinned parts of Pine and Birch stands, using data from 38 permanent sample plots established in 1925–42, and also 70 established in 1955–56. In the first decade after a moderate thinning (removing 20–30% of the standing volume), diam. m.a.i. of Pine on site class Ia–II was 0·5 mm. greater than that of controls; in the second decade (and in the first decade after light thinnings) m.a.i. was greater than in controls but to a lesser degree than in the first decade. In the *Betuletum oxalidosum* and *B. hylocomiosum*, after a moderate thinning, diam. m.a.i. in the first decade was also increased by 0·5 mm.; in drained Birch/fern/*Carex* stands it was increased by 0·2 mm. and in undrained stands remained virtually the same as the controls. For non-boggy Pine and Birch stands of site class Ia–III on mineral soil, of density 0·8 or greater, the first thinning should remove up to 25% of standing volume; the second thinning, 10 years later, up to 15%.

1832. Budowski, G. Efecto del entresaque en rodales jóvenes naturales de *Pinus pseudostrobus*, en Honduras. **[Effect of thinning in young stands of *P. pseudostrobus* in Honduras.]** *Comun. cient. agric. Inst. Interamer. Cienc. Agric., Turrialba* (*Dasonomía*) Hoja No. 11, 1960. pp. 4. [Span.]

Reports diameter and b.a. increment as measured in 1960, in a plot 50 × 50 m. thinned in 1957, when the trees were 14–15 years old, from 511 to 193 stems and from ca. 61 to ca. 42 sq. ft. b.a. Though the trees have grown well, the author doubts, from the much slower response of the smaller stems, whether the thinning has had much influence.

1833. Stiell, W. M. **Stem straightness as affected by row-thinning a Red Pine plantation.** *For. Chron.* 36 (3), 1960 (234–6).

A 20-year *Pinus resinosa* plantation, spaced at 6 × 6 ft., was thinned by removing every third row. Five years later the residual trees showed very little curvature, and it was concluded that row-thinning similar plantations would not result in sufficient sweep to degrade the value of the trees. *From author's abstract.*

1834. Drinkwater, M. H. **Crown release of young Sugar Maple.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 89, 1960. pp. 18. 6 refs. [E.e.*f.*]

Presents the results of a preliminary assessment of a crown-release experiment started in 1951 with young *Acer saccharum*, in which 3 degrees of complete crown release were applied to 20 selected crop trees on each of 10 small areas, viz. (1) light—crown allowed 3–4 ft. all round for expansion, (2) moderate—5–6 ft. for expansion; (3) heavy—8–10 ft. for expansion, with (4) unreleased controls. Analysis of 5 years' growth on an individual tree basis showed that significantly better b.a. increment followed treatments (2) and (3) than either (1) or (4), no significant increment differences being found between either (2) and (3) or (1) and (4). In appraising the contribution of several tree factors to b.a. increment, initial d.b.h. appeared most to influence the growth of trees after treatment, other significant factors being crown diam., % live crown, and inter-crown distance. The greatest response to release in terms of b.a. increment occurred in the dominant trees. There was no indication that these treatments would promote the growth of wolf trees. Increases in crown width appeared normal. Release had no determinable effect on height growth, natural pruning or epicormic branching. *From author's summary.*

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 1670–1, 1991.

1835. Zimmermann, H. Zur Spätlichtung der Buche. **[Late heavy increment thinning of Beech.]**

Allg. Forst- u. Jagdztg. 131 (9), 1960 (203–6). 7 refs. [G.g.e.]

Presents data on the increment put on from 1943 to 1959 by reserved final-crop trees on two 1-ha. plots formerly moderately thinned, in Wiesbaden municipal forest. On one plot the 72 reserved stems, 112 years old in 1943, with the gradual removal of the rest of the stand, produced 1·4 cu. m. per stem over the 16 years; on the other plot, 76 stems, 132 years old in 1943, put on 0·9 cu. m. per stem. Their total volume increment came to 67 and 72% respectively of Wiedemann's figures for site classes 1 and 3, moderately thinned, on ca. 26% of his stem numbers. The system is now being applied in modified form at about rotation age as a kind of extended shelterwood system, in order that specially selected stems may put on additional increment. The adverse effect on natural regeneration is said to be unimportant.

1836. PEEVY, F. A. **Controlling southern weed trees with herbicides**. *J. For.* 58 (9), 1960 (708–10).

Reviews effective methods (tested at the Southern Forest Experiment Station, Alexandria, La., during the past 15 years) of controlling weed trees with herbicides, with tabulated details of chemicals used, concentrations and dosages required, and costs. The methods include: application in axe cuts; basal stem spray; tree injection; foliar spray (applied with ground equipment or aerially); and soil application.

1837. SPOSTA, J. W. **Chemical removal of inferior tropical tree species**. *Trop. For. Note Trop. For. Res. Cent., Rio Piedras* No. 4, 1960. pp. 2.

A 5% solution of 2,4,5-T ester in diesel oil was applied to frill girdles on 1000 trees, and 12 months later 743 trees were dead, 203 showed various degrees of loss of vigour, and only 54 showed no crown effects. The % kill is tabulated separately for 16 Puerto-Rican species.

245. Tending of Trees, Pruning etc.

See also Nos. 1581–2.

1838. EDWARDS, M. V., STEWART, G. G., and HENMAN, D. W. **Silvicultural investigations in the forest: (B) Scotland and North England. Pruning**. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (45–6).

Analysis of trees blown down in the Inverliever pruning experiments, started 19 years ago in Norway and Sitka Spruce crops, showed no ill effects from the pruning of live branches, and illustrated again the smallness of the layer of knot-free timber laid on during that period. This emphasized the necessity of pruning only the largest, most vigorous trees in a crop, and of starting pruning when their d.b.h. is ca. 4 in., i.e. earlier than brashing is usually done.

1839. BROWN, J. H. **Fall and winter pruning of Pines in West Virginia**. *Current Report, West Virginia Agricultural Experiment Station, Morgantown* No. 26, 1960. pp. 7.

A study indicating that the customary pruning of Pines used for Christmas trees, usually performed in June–July, can also be done in winter on Scots and Red Pine, but not on White Pine. When the first two species were pruned at any time between September and March, they began to set buds as soon as new growth started and developed new shoots 2–6 in. long in the first growing season. In the second season growth was normal (up to 14 in. in the leader). White Pine developed no buds; pruned shoots made no growth, and trees eventually died back to the last unpruned whorl.

1840. MAY, C., and PALMER, J. G. **Effects of asphalt varnish-fungicide mixtures on growth in pure culture of some fungi that cause decay in trees.** *Arborists' News, Wooster* 24 (11), 1959 (83–6). L.S.

In order to investigate the possibilities of producing an antiseptic wound paint, 9 fungicides (captan, dichlone, ferbam, maneb, phaltan, phenyl mercury nitrate, thiram, zineb and a Ni carbamate) were tested in asphalt paint of the gilsonite varnish type against 11 wood-rotting fungi (*Fomes fraxineus*, *Pholiota adiposa*, *Pleurotus ostreatus*, 5 species of *Polyporus*, *Poria monticola*, *Schizophyllum commune* and *Stereum purpureum*). A formulation containing 0·25 g. phenyl mercury nitrate in 99·75 g. asphalt varnish was the most effective in inhibiting growth of the test fungi. Ferbam retarded growth of *P. ostreatus* and *S. purpureum*, phaltan retarded growth of *Polyporus sulphureus*, *P. monticola* and *S. commune*, and both retarded growth of *P. adiposa* and *Polyporus pergamensis*. Relative solubility and rate of migration of the active ingredients in water or in the nutrient agars probably influenced the width of the fungus-free zone in the test plates, but it is not necessary for a tree wound paint to be fungitoxic at a distance from its point of application.

1841. WOOD, R. F., and HOLMES, G. D. **Silvicultural investigations in the forest: (A) South and Central England and Wales. Chemical methods of pruning**. *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (42).

Preliminary tests of spraying unwanted side branches with amyl 2,4,5-T gave promising results with Poplars, but less so with epicormic branches of Oak. If successful, this method will result in a great saving in manpower for pruning.

249. Tending: Miscellaneous

See Nos. 1825, 1992.

25. Treatment of Defective, Derelict or Very Open Stands

1842. MROCZKIEWICZ, L., and URBAŃSKI, K. Zagadnienie inwentaryzacji i zagospodarowania luk w drzewostanach. **[Surveying and managing gaps in stands.]** *Sylwan* 104 (7), 1960 (7–19). 4 refs. [Pol.]

Presents Polish terms and definitions for various degrees of understocking and various sizes of gaps, and discusses the performance of *Betula verrucosa*, *Fagus sylvatica*, *Quercus robur*, *Q. sessiliflora* and *Tilia cordata* planted or sown in gaps and understocked areas in Pine stands. [Cf. *F.A.* 15 No. 3578.]

1843. Majer, A. A rontott erdök átalakítása. **[Conversion of degraded forests.]** *Erdö* 7 (8), 1958 (241–57). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (8). [E.] C.G.B.

Defines a degraded stand as one deficient in quantity and quality of growing stock, i.e. growing fewer than one valuable crop tree every 5–7 (or 8) m. (400–200 (150)/ha.); or dominated by less valuable shade-bearers (Hornbeam, Field Maple); or by light-demanding pioneers (Birch); or consisting of pure stands; or with the second storey removed or dominated by wolf trees, coppice and shrubs. Methods of converting each type are indicated.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

See also No. 2634.

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See also No. 1597.

1844. Bauer, E., and Streletzki, H. Untersuchungen zur forstgeschichtlichen Entwicklung des Kondelwaldesim Bezirk Trier unter besonderer Berücksichtigung der Röderwirtschaft. **[Forest history and development of the Kondelwald in Trier district, with special reference to the traditional "Röder" system of coppice with field crops.]** *Allg. Forst- u. Jagdztg.* 131 (9), 1960 (193–203). 32 refs. [G.g.e.]

Describes the history of species composition, yield, silvicultural system etc., including the traditional "Röder system" in which 1–4 years of cereal crops alternated with short coppice rotations. Soil analysis on "Röder" sites and comparable sites that had been continuously under forest, indicated that on the better sites, intermittent agricultural use had a favourable effect in terms of exchangeable CaO and K_2O, structure, and content and distribution of organic matter, and on the poorer sites no adverse effect.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

1845. Forgó, L. Gazdálkodás a hullámtéren. **[Farming on flood-plains.]** *Erdö* 7 (5), 1958 (161–5). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (7). [E.] C.G.B.

Defined as the area occupied by the river between dykes at peak inundation, the flood-plains of the Tisza, Körös, and Maros rivers total 73,000 ha., comprising tree-less strips, Willow stands, woodlots, pasture and arable. Planning could allocate 35,000 ha. to timber. With a 40-year rotation of fast-growing species, e.g. Poplars, the yield could be 200,000 cu. m. of logs and 60,000 cu. m. of other assortments.

1846. ***Eucalyptus* in irrigated plantations in the Gezira**. *Extr.* from *Rep. For. Dep. Sudan 1958/59*, 1960 (73–4).

Of a large number of Eucalypts being tested on cracking clay soil under irrigation, *E. brockwayi*, *E. microtheca* and *E. redunca* var. *elata* show fastest growth. Various sizes and qualities of polythene tubes have been tested, in order to find a satisfactory substitute for the expensive tin tubes at present used, and gave good results. The best mixture for making soil blocks was found to be equal parts of silt, sand and dry leaves.

1847. Qadri, S. M. A. **Conservation of water in the irrigated plantations.** *Pakistan J. For.* 10 (2), 1960 (115–6).

Experiments are in progress in W. Pakistan to determine the water requirements of the principal species grown in irrigated plantations—*Acacia arabica*, *Dalbergia sissoo*, *Salmalia malabarica* [*Bombax malabaricum*], and *Populus euphratica*. Interim results reveal facts that are of interest for water conservation. The first three species showed no appreciable difference in growth if irrigated in March, April and May or in May only, so that there is a possibility of considerable saving by not irrigating in March and April. *P. euphratica*, on the other hand, responded well to water supplied in those months. Late irrigation (Jan.–March) benefits *A. arabica*, *D. sissoo* and *P. euphratica*, but not *S. malabarica*, in which growth stops completely from Nov. to March. Each species has a particular period of maximum growth rate, which remains constant even if irrigation conditions vary; e.g. the highest rate of growth is attained by *P. euphratica* and *S. malabarica* in June, but by *A. arabica* and *D. sissoo* in Sept. The bearing of these facts on the timing of irrigation for the plantations, choice of agricultural crops to be grown in the same area (i.e. crops having peak water requirements at a different time from the trees), and mixed plantations are briefly discussed.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See Nos. 1378, 2251.

266. Shelterbelts, Windbreaks

See also Nos. 1376, 1791, 1812, 1826–7.

1848. King, A. J. **The siting, form and maintenance of a shelterbelt for a high-lying, stock-raising hill farm.** *Quart. J. For.* 54 (4), 1960 (363–6).

With special reference to England.

1849. Burmistrovs, A. Dārzu aizsargstādījumi Latvijas PSR. **[Shelterbelts for orchards and market gardens in Latvia.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (237–50). 10 refs. [Latv.russ.] N.L.L.

Studies the effect of shelterbelts already in existence, and recommends belts of 2–4 rows of trees plus 1–2 rows of shrubs. The best species to use are Poplar, Willow, Birch, Maple, *Alnus glutinosa*, Hazel, *Caragana arborescens*, etc.

1850. Benkovits, K. Legelövédö fásítás. **[Planting of shelterbelts on pastures.]** Mezögazdasági Kiadó, [Budapest?] 1957. pp. 150. [Hu.] From *review* in *Hung. agric. Rev.* 7 (2), 1958 (9). [E.] C.G.B.

Hungary has 100,000 ha. of degraded pasture and overgrazed forest lands, and the benefits to grass of shelter have been demonstrated locally. Principles and practical operations (for each forest region, soil and pasture type) are described, and choice of trees, shrubs, and belt structure are indicated countywise by soils. The essential factors for success, e.g. requirements in manpower, material, and time [for soil preparation, planting, filling blanks, tending, and the working-plan procedure] are discussed in detail.

1851. Smal′ko, Ja. A. Vetrozaščitnye svojstva lesnyh polos v zavisimosti ot formy ih poperečnogo sečenija. **[The protective properties of shelterbelts in relation to their cross-sectional shape.]** *Lesn. Hoz.* 12 (9), 1960 (27–30). [Russ.]

Compares, for (1) dense, (2) open, and (3) permeable shelterbelts, the following cross-sections [end-elevation]: (*A*) close to a rectangle; (*B*) close to an isosceles triangle; (*C*) concave (the outer trees taller than the centre ones); and (*D*) close to a triangle, with the windward side sloping more gently than the lee side. The best shapes for (1), (2) and (3), as determined by field tests, were (*D*), (*A*) and (*B*) respectively. It was also found that whatever the cross-sectional shape, (3) exercised a greater protective effect than did (1) or (2).

1852. Selivanov, G. I. Iz opyta rubok uhoda v zaščitnyh nasaždenijah. **[Thinning trials in shelterbelts.]** *Lesn. Hoz.* 12 (3), 1960 (26–9). [Russ.]

A general account of trials in which five different thinning regimes were tried in railway shelterbelts 8–14 years old and in some older ones. The thinnings were aimed at a more even distribution of snow throughout the belt, so avoiding accumulations and snow breakage at the field-side margin. Some recommendations are made.

1853. Telešek, Ju. K. Vetrozaščitnoe značenie lesnyh polos na malosvjaznyh počvah. **[The importance of shelterbelts for wind protection on soils of poor cohesion.]** *Vestn. sel′.-hoz. Nauki* 5 (7), 1960 (107–10). [Russ.e.g.f.] O.W.

Studies were made of the mechanical composition of the top 5 cm. of a sandy soil near, and also the condition of crops protected by, a 7-row permeable shelterbelt, 12 m. high, in the Kherson region. The % of small fractions (particularly <0·1 mm.) in the soil was much greater in the shelter of the belt, especially for distances up to 10 times its height; also, far fewer young plants were damaged by wind, even at distances 25 times the height of the belt, than in unprotected control fields.

1854. Pis′mennyj, N. R. Sistema lesnyh polos —nadežnaja zaščita ot pyl′nyh bur′. **[Shelterbelt networks—a reliable protection against dust storms.]** *Lesn. Hoz.* 12 (7), 1960 (23–8). 1 ref. [Russ.]

Gives some examples of the effectiveness of shelterbelts in protecting fields in the Stavropol area during the severe dust storms in March and April 1960, when wind speeds were 20–30 m./sec.

1855. Pavlovskij, E. S. Hozjajstvennaja cennost′ lesnyh polos v Kamennoj stepi. **[Yields from shelterbelts in the Kamennaya Steppe.]** *Lesn. Hoz.* 12 (7), 1960 (55). [Russ.]

Tabulates data on yields (by assortments) from the shelterbelts of the V. V. Dokučaev Agricultural Research Institute for the period 1950–59.

1856. Boixo, [P.] de. De la protection des cultures contre les dégâts des vents à Cuxons (Pyr.-Or.), Hénon (C.d.N.), Cheraia (Maroc). **[The protection of crops against wind damage at Cuxons (E. Pyrenees), Hénon (Côtes du Nord) and Cheraia (Morocco).]** *C. R. Acad. Agric. France* 46 (10), 1960 (585–95). 4 refs. [F.]

Presents the results of observations on the damage caused by wind to crops in these places, and the protection afforded by shelterbelts, and draws the following conclusions: If the shelterbelts do not completely surround the crop, they should be sited at right angles to the prevailing wind. Wind velocities >8 m./sec. will damage flowering crops. For velocities between 7 and 17 m./sec. a continuous shelter 6–8 m. high will reduce these velocities by 50, 20 and 0%, at a distance, respectively, ca. 7, 10 and 12 times its height.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 1375, 1484, 1978.

1857. Gatherum, G. E. **An analytical approach to the management of forest land for beef cattle and timber production.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (565–74). 12 refs. O.R.E.

In the establishment of an optimum combination norm for beef cattle and timber production in the Longleaf/Slash Pine forest type of the S.E. United States, the author has evaluated existing data through the principle of the marginal rate of substitution. A detailed description of the transformation of basic physical data to usable economic information is presented. However, a lack of complete physical, revenue, and cost data at several intensities of cultural treatments necessitates a shift from a practical to a theoretical conclusion.

1858. Ehrenreich, J. H. **Usable forage under Pine stands.** *Sta. Note Cent. St. For. Exp. Sta.* No. 142, 1960. pp. 2. 1 ref.

A study in Missouri in 1951–58, on plots thinned to 50, 70, 90 and 110 sq. ft. b.a./acre, with unthinned controls at 130 sq. ft./acre, showed that herbage yield increased 4–5 times as b.a. decreased from 130 to 70, and >14 times for a decrease from 130 to 50 sq. ft./acre. Timber production in stands thinned to 70 sq. ft./acre was still good.

1859. Vallentine, J. F. **Live Oak and Shin Oak as desirable plants on Edwards Plateau ranges.** *Ecology* 41 (3), 1960 (545–8). 8 refs.

Studies in Kerr County, Texas, showed that open stands of Oak species were beneficial, providing browse and increasing herbage production, as compared with sites without Oak. Cedar (*Juniperus ashei*) was undesirable because of its low palatability, severe competition with grasses, and hindrance to livestock handling.

1860. Martín Bolaños, M. Las plantas leñosas en la alimentación y pastoreo de la ganadería española. **[Woody plants as a source of fodder for stock in Spain.]** *Montes, Madrid* 16 (94), 1960 (347–51). [Span.]

Reviews species supplying fruit and foliage suitable for fodder, and recommends further research in this field.

1861. Hutton, E. M., and Bonner, I. A. **Dry matter and protein yields in four strains of *Leucaena glauca* Benth.** *J. Aust. Inst. Agric. Sci.* 26 (3), 1960 (276–7). 6 refs. O.R.E.

Reports trials showing the Peru strain to be significantly better than strains from El Salvador, Guatemala and Hawaii. The aim in breeding work is to retain the high dry-matter and protein yields of the Peru strain but eliminate its poor seeding ability and high frost-susceptibility. [Cf. *F.A.* 21 No. 1813.]

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 1729.

1862. Kochummen, K. M. **List of tree species at the Forest Research Institute, Kepong.** *Malay. Forester* 23 (3), 1960 (230–5 + 3 photos).

1863. Babb, M. F. **Ornamental trees and shrubs for Alaska.** *Bulletin, Alaska Agricultural Experiment Station, Palmer* No. 24, 1959. pp. 39. 24 refs.

Summarizes findings from a 9-year study of woody ornamentals in Alaska. Species considered include 24 trees, native or introduced.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

See Nos. 1432, 1839.

282. Bark Crops

See No. 2584.

283. Fruit and Seed Crops etc.

1864. Kassandreas, P., and Kōnstantellos, A. Hē charoupia—hē kalliergeia kai oikonomikē tēs sēmasia. **[The Carob—its cultivation and economic significance.]** *Das. Chron.* 2 (17), 1960 (772–5). [Gk.]

Describes *inter alia* its distribution in Greece and elsewhere, the average yield of its fruit (tons) for the main countries, and the chief features of its cultivation.

1865. Sebastos, K. Hē charoupia eis tēn Krētēn. **[The Carob tree in Crete.]** *Das. Chron.* 2 (20/21), 1960 (885–9). [Gk.]

In Crete, chief producer of Carob beans (40,000 out of a total Greek production of 50,000 tons p.a.), the tree is estimated to occupy 205,000–210,000 stremmas, mostly as orchards, but also as scattered wild trees. Some account is given of its cultivation, costs and processing, and of the serious fly pest, *Schizomyia gennadii*, of the fruit (little controlled). Concludes that Crete could produce 20 times its present output by scientific grafting, better tending and protection, etc.

1866. Nekrasova, T. P. O biologičeskih osnovah organizacii kedrovyh orehopromyslovyh hozjajstv v Zapadnoj Sibiri. **[Biological basis for organized exploitation of *Pinus sibirica* "nuts" in W. Siberia.]** *Vestn. sel′.-hoz. Nauki* 5 (7), 1960 (111–4). [Russ.e.g.f.] O.W.

Discusses cone yields and their prediction in the Tomsk region, cone collection, etc.

284. Crops Tapped for Exudations etc.

See also Nos. 1433, 1908.

1867. Senilov, A. A. Bor′ba s korroziej podsočnyh instrumentov. **[Controlling corrosion of tapping tools.]** *Gidrol. lesohim. Prom.* 13 (6), 1960 (22–3). [Russ.] P.R.

Lists several measures (e.g. improved steels, use of talc or graphite instead of kaolin for making the acid paste) for reducing corrosion of tools used with acid stimulants in tapping.

1868. Olovenikov, G. B. Novye konstrukcii hakov. **[New hack designs.]** *Gidrol. lesohim. Prom.* 13 (2), 1960 (22–5). [Russ.] P.R.

[Cf. *F.A.* 21 No. 4414.] Describes and illustrates the SN-2 hack (designed by Sosnin), the No. 5 hack with Romaško's regulator, and a modernized hack (designed by Stepančuk). The latter is particularly suitable for making ribbed faces in which each streak drains into the lower end of the one previously cut on the other half of the face, in a staggered herringbone pattern, so dispensing with a medial gutter.

1869. Kamiński, E. Metody stosowania bodźców chemicznych przy żywicowaniu. **[Methods of applying stimulants in resin tapping.]** *Sylwan* 104 (8), 1960 (1–18). 17 refs. [Pol.Russ.E.]

Reviews the history of the use of chemical stimulants, various kinds of stimulants, and methods of application, with particular reference to practice in the U.S.A., U.S.S.R., and Poland.

1870. Clements, R. W. **Modern gum naval stores methods manual.** Southeastern Forest Experiment Station, Asheville. 1960. pp. 30.

An extension booklet summarizing research and methods developed at the Lake City Research Center, including size of faces, acid treatment, tools, etc. for standard and intensive (short-cycle) tapping, always considering the effect on the trees.

1871. Vysockij, I. V. Dvuh″jarusnaja podsočka s razmeščeniem karr v šahmatnom porjadke. **[Two-storey tapping, with the faces arranged in an échelon pattern.]** *Gidrol. lesohim. Prom.* 13 (1), 1960 (12–3). 5 refs. [Russ.] P.R.

In a 10-year tapping period before felling Scots Pine, one face only is tapped for the first seven years, at both ends, i.e. the top by ascending, the bottom by descending streaks. In the last three years before felling, no more ascending streaks are used; the face is only continued downwards with descending streaks, while a new face is made below and to one side of the first one and is also tapped by descending streaks. This general sequence of tapping, illustrated for various tapping periods from 10 to 1 year before felling, is claimed to give higher yields than conventional methods.

1872. Nikolić, S. Dinamika curenja smole. **[Dynamics of resin flow.]** *Šumarstvo* 13 (1/2), 1960 (71–8). 3 refs. [Serb.f.]

In experiments in the Ušće district in Aug. 1957, ca. 80 faces were cut on each of 3 plots of 23–27 stems (mean d.b.h. 53·7–58·1 cm.) in a 150- to 200-year *Pinus nigra* stand. The faces, cut by a method previously described [see *F.A.* 17 No. 1611], were 10 cm. wide and 8–10 cm. apart at a height of 3 m. on the S.W. side of the stems. Faces in plot (*a*) were untreated, in (*b*) were treated with 50% H_2SO_4, and in (*c*) with 25% HCl + 3% $CaCl_2$. Resin production was measured every 24 hours after cutting each face, and detailed results for each stem are tabulated. Calculation of the rate of flow showed that production after 48 hours was 88·23, 93·62, and 93·44% of the total yield for (*a*), (*b*) and (*c*) respectively. Mean total yield per face was (*a*) 16·3, (*b*) 31·5 (93% greater than (*a*)), and (*c*) 35·9 g. (120% greater than (*a*)). In all cases, resin-flow ceased after 3–4 days, stimulators increasing the yield without prolonging the period of flow. When similar experiments on (*a*) and (*c*) plots were carried out in Oct. 1957, the mean yield after 48 hours was (*a*) 6·73 g./face (81·88% of the total), the yield for (*c*) being 92% higher. Thus rate of flow and the proportionate difference in yield remained broadly similar. [Cf. *F.A.* 19 No. 3025.]

1873. Dudić, M. Prirodno zaraščivanje belenica na crnom boru. **[Natural healing-over of *Pinus nigra* faces.]** *Šumarstvo* 12 (11/12), 1959 (549–59). 10 refs. [Serb.serb.e.]

To determine the rate of healing, the mean width (8·8 cm.) of 1324 French faces cut in 1938 and the width not healed over in 1953 were compared. Four classes were recognized: (1) rapid (76–100% healed); (2) good (51–75%); (3) medium (26–50%); (4) slow (0–25%). It was found that 1·1% of all faces were in class (1), 8·8% were in (2), 46·3% in (3) and 43·8% in (4). Rate of healing was not influenced by tree diameter, but was related to the width of annual rings. Trees in (1) had much wider annual rings than those in (4).

1874. Pejoski, B. Tehnološkite promeni na drvoto od smolarenite stebla na crniot bor (*Pinus nigra*, Arn.) od karbonatnite podračja na Poreče (NRM). **[Technological changes in wood of tapped *P. nigra* stems from the limestone regions of Poreče (Macedonia).]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 12, 1958/1959 (1959), (67–99). 16 refs. [Maced.f.*f.*]

The effects of long-term tapping were tested on a total of 3866 samples from stems of 7 mature trees of good form, which had been tapped for ≮16 years, 5 by the French method and 2 by the 'kotlec' method. The properties of three types of wood at face height were compared: (*a*) normal sapwood; (*b*) resinous sapwood (from the zone formed by penetration of resin into the tracheids to replace lost moisture between face and heartwood, and extending irregularly some 50 cm. above the highest cut); (*c*) heartwood. For (*b*), density was 23% greater than for (*a*), oven-dry, and 17% greater at 12% m.c.; specific gravity was 23·6% greater than for (*a*) and 9% greater than for (*c*); volume shrinkage was 21·3% less than for (*a*) and 22% more than for (*c*); saturation point was 41·8% lower than for (*a*) and 13·7% higher than for (*c*); static bending strength was 15·5% lower than for (*a*) and 9·4% higher than for (*c*). There was little difference in impact bending strength, resistance to axial compression and cleavage between (*a*) and (*b*). Tensile strength of (*a*) was 16% higher than that of (*b*) in a tangential and 2% higher in a radial direction. The resin content of (*b*) was 15·82% vs. 7·4 for (*a*) and 12·0 for (*c*). It is recommended that the basal 4 m. of tapped stems should not be sawn, but used for the extraction of resin and tar. [Cf. *F.A.* 21 No. 4419.]

1875. Gordeev, A. V. Organizacija opytno-proizvodstvennyh hozjajstv dlitel′noj podsočki. **[Organization of experimental-cum-production farms for long-term tapping.]** *Gidrol. lesohim. Prom.* 13 (5), 1960 (14–5). [Russ.] P.R.

As it has been officially recommended that suitable areas should be found for raising plantations of *Pinus nigra* var. *caramanica* with a high resin yield, and that 10,000–12,000 ha. should be planted annually, it is recommended as desirable to set up immediately a few experimental-cum-production tapping farms in the Crimea area to work existing stands. Two suitable farms are proposed, and their yields analysed in detail, on the basis of small pilot trials.

1876. Bedenko, V. F. Podsočka sosny s primeneniem sernokislotnoj pasty. **[Tapping Scots Pine, using H_2SO_4 paste.]** *Gidrol. lesohim. Prom.* 13 (2), 1960 (20–1). 1 ref. [Russ.russ.] P.R.

A general account of tapping by the ascending ribbed method with H_2SO_4 paste, in stands due to be felled in a few years, and mainly on faces reaching heights >280 cm. from the ground.

1877. Trefilov, P. S. Vlijanie himičeskogo vozdejstvija pri podsočke na žiznedejatel′nost′ nasaždenij. **[Effect of chemical stimulants used in tapping on the vitality of the stand.]** *Gidrol. lesohim. Prom.* 13 (4), 1960 (20–1). 1 ref. [Russ.] P.R.

From data on resin yields and on the condition of [Scots] Pine after 8 years' tapping with NaClO it is concluded that its use is permissible for 10 years before felling. The following schedule is recommended: period between freshenings ≮7 days; dose of NaClO paste ≯1 g./10 cm. width of face; freshening depth 5–6 mm.; streak interval measured between centres, 1·5 cm. (with a 7-day freshening cycle) and 2·5 cm. (14-day cycle).

Three years' tapping with H_2SO_4 has not impaired resin yields and stand condition. It appears that the total expenditure in terms of concentrated H_2SO_4 per season, should be 7–9 g. on a face 30 cm. wide.

1878. Niloanich, S., and Premrasami, T. **Effect of chemical stimulation on gum flow of *Pinus***

***khasya* and *Pinus merkusii* in Thailand.** *Proceedings of the 8th Pacific Science Congress, Manila 1953* Vol. 5, 1959 (367–78). From *abstr.* in *Chem. Abstr.* 54 (20), 1960 (21589). P.R.

P. khasya and *P. merkusii* faces, treated with 10–60% H_2SO_4, yielded substantially more resin than untreated controls. Highest yields were obtained from *P. merkusii*, trees of 150–200 cm. diam. treated with 50% H_2SO_4 giving a mean flow of 220 ml. over a 7-day period, i.e. up to thrice the maximum flow from *P. khasya*.

1879. MEDNIKOV, F. A., and BELONUČKIN, P. P. Desjatiletnjaja podsočka eli v Tihvinskom himleshoze. **[Ten years of tapping Spruce in the Tikhvin khimleskhoz.]** *Gidrol. lesohim. Prom.* 13 (3), 1960 (25–6). 9 refs. [Russ.] P.R.

These trials have concentrated on the use of narrow, vertical faces, 1–2 cm. wide, $\nless$ 10 cm. apart, up to 250 cm. long [at one cutting]; and 4, 6 or 8 per tree, depending on girth. A special hack is used to make the faces in the spring, and the resin is collected once every two years in the autumn or, in the last 3–4 years before felling, in early summer. This system over the 10 years has neither reduced diameter increment, nor impaired the physical and mechanical properties of the wood. Total labour costs per ton of resin (faces 1 cm. wide) were 70 man-days, as against 101·5 in the intensive CNILHI method [see *F.A.* 21 No. 4423]. The resin collected contained 79·1% rosin, 10% turpentine, 5% water, 5·9% impurities.

1880. **Tapping methods [for *Acacia senegal*.]** *Extr.* from *Rep. For. Dep. Sudan 1958/59*, 1960 (84).

Experiments made with the tools used in rubber tapping showed such short-handled tools to be impracticable, firstly because the Acacia tree, with its much branched crown and thorny branchlets, will not permit their use with any comfort, and secondly because the bark is tough. The established method of using a small axe appears to be the best. In some areas there is an alternative method in which the local hoe, similar to the Dutch hoe, is used to scrape the bark instead of tearing off a strip.

1881. ROBBINS, P. W. **The yield of Maple sap per taphole.** *Quart. Bull. Mich. Agric. Exp. Sta.* 43 (1), 1960 (142–6). 16 refs.

In a study in a previously untapped 70-acre *Acer saccharum* woodland in Michigan, measurements of sap and its sugar content were taken every day of flow for 4 seasons. The number of trees tapped and tapholes varied from 72 to 122 and from 120 to 170 respectively. Mean annual yield per taphole over the 4 years was 19·05 gal. of sap (mean sugar content 2·38%), ca. ½ gal. syrup, and 3·62 lb. sugar. These yields are greater than those previously recorded in the literature, and demonstrate the potential production from ungrazed woodland managed for timber.

1882. CHING, T. M., and MERICLE, L. W. **Some evidences of premature stoppage of Sugar Maple [*Acer saccharum*] sap production.** *For. Sci.* 6 (3), 1960 (270–5). 12 refs.

[Cf. *F.A.* 19 No. 1778.] Premature stoppage is shown to result both from a bacterial invasion of living tissue via pits, and from an actual blockage caused by micro-organisms and/or gummy plugs produced by them. Bacteria isolated from tapping showed pectolytic activity, suggesting the means by which pit membrane penetration is effected.

286. Osier-Growing

1883. STEIKHARDT, H. Untersuchungen über Sortenwahl, Stickstoffdüngung, Pflanzgutgrösse und Pflanzverband im Korbweidenbau. **[Trials of varieties, of N fertilizers, of size of cuttings and of spacing in osier growing.]** *Kühn-Archiv, Halle* 72 (4), 1958 (376–429). 67 refs. [G.g.russ.e.f.] C.G.B.

Of 7 varieties tried on 7 sites, "Kottenheider" (a *Salix amygdalina*) was best in quality and, on moist sites, among the best in yield. On drier sites, *S. viminalis* varieties did best. Yields, but not quality, were best on moist sites. Similarly, N fertilizing increased yield but lowered quality, though with $\leqslant$ 40 kg. N/ha. the loss in quality (flexibility etc.) was small. The larger the cutting, the greater the yield and the size of osiers, but differences tended to disappear after a few years. Close spacing within rows also gave greater yields to begin with, but wider spacings gave longer and stronger osiers.

287. Bamboo and Cane Growing etc.

See also No. 1396.

1884. RATANABHAN, M. **[Bamboo plantation in Prachinburi.]** *Vanasarn* 18 (1), 1960 (55–8). [Siam.]

Describes local native practice in propagating and utilizing the Pai Tong Bamboo [*Dendrocalamus asper*], which is fairly common in the S. part of Thailand, and gives detailed recommendations for improving techniques, both of propagation and for export of the edible shoots.

1885. KHAN, M. A. W. **Ecology and potentiality of the Bamboo forests of Bilaspur Division, Madhya Pradesh.** *Indian For.* 86 (10), 1960 (575–89).

Discusses the distributional pattern of *Dendrocalamus strictus* forest in relation to climate, geology, soil etc., with details of associated vegetation. In order to determine the productive potential of these forests, a multi-stage sampling technique was adopted, and a number of growth factors were assessed separately (density of stocking, clump density, length/girth correlation for commercial-length culms, length of commercially usable culms, internode length, weight/number and weight/length correlations for full-length green culms, weight/length correlation for 6-ft. lengths, air-dry/green weight conversion factors). The computed results are tabulated.

288. Crops Grown for Animal Products

See also No. 1488.

1886. ŠARAPOV, N. I., and PROKOPENKO, A. I. O vozmožnosti polučenija natural'nogo šellaka. **[The possibilities of producing natural shellac [in the**

U.S.S.R.].] *Izv. Akad. Nauk SSSR* (*Ser. biol.*) 1960 (5), (781–6). 9 refs. [Russ.russ.e.] A.P.B.

A preliminary trial in Tadzhikistan in 1944 pointed to the possibility of successfully acclimatizing *Laccifer lacca* in the U.S.S.R. and of finding suitable host plants for it. The most promising areas for introducing the insect are the Black Sea coast of the Caucasus, the Lenkoran plain (Azerbaijan), E. Georgia, and the Atrek region (S.W. Turkmenistan). Since 1956, experiments have been going on under glass at Leningrad, and in the open at Sukhumi, Anaseuli and Batumi (Black Sea coast of the Caucasus), and it has proved quite practicable to introduce and establish *L. lacca* from S. China. The best host plants discovered so far, whether native to or naturalized in the area, are *Zizyphus jujuba*, *Paliurus spina-christi*, *Ficus carica*, *Diospyros kaki*, *D. lotus*, *Albizzia julibrissin*, *Corylus maxima* and *Hovenia dulcis*. In 1960 a permanent experimental station for lac cultivation was set up at Sukhumi.

1887. TANTAWUTTOE, A. **[Breeding lac insects on Pudsa [*Zizyphus jujuba*] trees.]** *Vanasarn* 18 (2), 1960 (39–44). [Siam.e.]

Reports successful experiments in raising lac insects on *Z. jujuba*, instead of the usual Jamjuri (*Albizzia lebbek*), in both the central region and the hot N.E. part of Thailand. Breeding was started both in the rainy season (May–June) and in the hot (Nov.–Dec.), brood lac from hot-season stock being transplanted to other *Z. jujuba* for the rains. The procedure is described in some detail. Brood lac could be transferred from both *A. lebbek* and *A. lucida* to *Z. jujuba*, and vice versa, in both rainy and hot seasons, but brood from *Z. jujuba* did not flourish on *Schleichera trijuga*. Estimates of lac production and income are made, comparing favourably with current horticultural or agricultural income, and extension of the industry is urged. [Cf. *F.A.* 12 p. 400.]

1888. FILIPPOVIČ, JU. B. Ocenka pitatel′nogo dostoinstva kormovyh rastenij dubovogo šelkoprjada pri pomošči aminogramm. **[Evaluating the nutritive value of the food plants of *Lasiocampa quercus* by means of ‘aminograms’.]** *Dokl. Akad. Nauk SSSR* 131 (4), 1960 (972–5). 18 refs. [Russ.russ.] A.P.B.

Paper chromatographic analyses were made to determine the amounts of free and bound amino-acids in leaves of *Quercus robur*, *Salix cinerea*, *Carpinus betulus*, *Corylus avellana*, *Betula verrucosa* and *Robinia pseudoacacia*, as a means of assessing their food value for this silkworm. Willow and Birch were the best substitutes for Oak, followed by Hazel and Hornbeam. This method of assessment is considered the best for determining food quality.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

1889. Kontakt med arbetsstudie-organisationerna. **[Contact with the work-studies organizations.]** *Norrlands SkogsvFörb. Tidskr.* 1960 (3), (195–252). [Sw.e.*e*.]

Lectures on: The organizational set-up of work studies [in Sweden] (*A. Staaf*); The work-study aspects of the felling, barking and primary conversion of wood (*A. Burénius*); Transport of wood on the roads, and in the forest [including skidding] (*C. E. Malmberg*); and Logging wage systems (*K. Kilander*) [discussing differences in rate fixing and industrial bargaining between industry and forestry, etc.].

302. Man and Work (Physiology and Psychology)

1890. KAMINSKY, G. Arbeitsphysiologische Grundlagen für die Gestaltung der Forstarbeit. **[Physiology of work as a basis of forest work studies.]** *Mitt. BundesforschAnst. Forst- u. Holzw.* No. 46, 1960. pp. [iii] + 183 + 8 + 3 + 9 + 3 tbls. 118 refs. [G.]

A review of methods and research results, discussing *inter alia* the effect of working conditions, tools, posture etc., on calorie consumption, pulse rates, fatigue etc., the working out of norms, performance rating, organizing sequences of work, etc., particularly in logging and transport.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 1641, 1672, 1698–1701, 1713, 1728, 1750, 1755, 1758, 1789–91, 1812, 1868, 1880, 1979–81, 1986, 2071.

1891. HUGGARD, E. R., and OWEN, T. H. **Forest tools and instruments.** Adam and Charles Black, London. 1960. pp. viii + 119. Price 18*s*.

A companion volume to *Forest Machinery* [cf. *F.A.* 20 No. 4619] covering: establishment and tending tools (including those for soil testing and fencing); tree measuring instruments; surveying instruments; extraction and utilization equipment (excluding power-driven machines, but including drawbar dynamometers, a transistorized metal detector, and timber impregnation plants); meteorological instruments; and office and other equipment (including binoculars, stereoscopes, planimeters, drawing instruments).

1892. **Equipment section.** *Unasylva* 14 (3), 1960 (151–3).

Includes specifications and photographs of: Silvano furrower (Attrezzi agricoli e forestali, Nicastro, Italy) [designed for use in nursery sowing or planting, to open parallel furrows in loose, sandy and volcanic soils or in humus; also serves for covering seed and for hoeing and weeding]; The Sparmatic (Gearmatic Co. Ltd., Newton, B.C., Canada) [steel spar-tree mounted on conventional vehicle; employs a hydraulic ram to erect the tubular spar to vertical operating position and to lower it to horizontal travelling position]; Hathaway portable powered winch (L. Hathaway Ltd., Oswestry, Shropshire) [developed jointly by manufacturers and Forestry Commission]; Cundey Loader (Cundey's Ltd., Alfreton, Derbyshire) [developed by the Forestry Commission]; Holt spray attachment for Holt Weed Breakers (Holt Weed Breaker Co., Kirbymoorside, Yorks) [developed in connexion with heavy-duty Holt weed-breakers as used in the tropics and subtropics, to make possible the economical application of herbicides in dense growth; from jets in a rear-fitted boom, herbicide is directed on to the blades of the weed- or bracken-breaker and, as these blades revolve, is transferred to the cut and lacerated stems of the weed growth]; Stetson-Ross Chip Blanker (Stetson-Ross Machine Co. Inc., Seattle) [a planer that removes chips rather than shavings, the chips being suitable for use by pulp mills]; Sumner Planer Chipper (Canadian Sumner Iron Works Ltd., Vancouver) [designed for planer mills but may also be operated as an independent chip producer]; Log Bronc (Nelson Log Bronc Co., Cove Bay, On.) [steel-hulled boom boat]; Skyline Crane "Telegrue" (H. E. Weber, Grenoble, France) [can lift up and set down loads up to 2 tons at any point on a cableway without a stopping block].

1893. Les pneus de génie civil. **[Tyres for use with civil engineering equipment.]** *Bois For. Trop.* No. 73, 1960 (31–42). 3 refs. [F.e.span.]

Information on the choice, inflation, maintenance, storage, conditions of use, and life of tyres for use on graders, heavy tractors, logging arches etc.

31. Logging and Transport: General

See Nos. 1494, 1913, 1923.

32. Felling and Related Operations

See also No. 1649.

322. Felling Season. Preparatory Measures

See No. 2358.

323. Felling and Subsequent Primary Conversion

See also Nos. 1901 *et seq.*, 1923–4.

1894. **[Automation and semi-automation of primary conversion in the U.S.S.R.]** *Lesn. Prom.* 1960 (11), (1–18). [Russ.]

A collection of papers: Automation of production in lespromkhozes (*D. M. Gusarčuk*) [reviewing research by CNIIMĖ]; Problems in planning automation at industrial log depots (*D. K. Voevoda*) [a discussion of automated branch removal (from whole trees), and complete primary conversion]; Automation of primary conversion (*B. A. Vasilev* and *Ju. S. Komarov*); Semi-automatic line based on a power chain-saw (*Ja. E. Levickij*) [the CNIIMĖ saw [cf. *F.A.* 20 No. 1049] for cross-cutting tree-length logs]; The economics of using semi-automatic lines (*Ja. M. Kaplun*).

1895. OSIPENKO, V. A., and VOJTKO, S. N. Priemy valki na gornyh sklonah. **[Methods of felling trees on mountain slopes.]** *Lesn. Prom.* 1960 (10), (14–5). [Russ.]

An illustrated description of methods recommended for felling Carpathian Beech of various sizes, with and without rot, discussing particularly the dimensions, shape and location of the undercut.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 1696, 1817, 2231.

1896. CHYLAK, R. Deklasirano drvo četinara. **[Conifer waste wood.]** *Nar. Šumar, Sarajevo* 13 (11/12), 1959 (685–92). 1 ref. [Croat.g.]

Concludes from studies in Slovenia and Croatia that the extraction and utilization of waste wood from felling areas, windthrown trees, etc., is economic. A large % of this waste is suitable for pulp, and can replace more valuable wood; most of the remainder is useful as fuel. [Cf. *F.A.* 21 No. 1120.]

1897. ABOLIN′Š, JA. T., and IEVIN′Š, I. K. Količestvo lesosečnyh ostatkov v Latvijskoj SSR i vozmožnosti ih ispol′zovanija. **[The amount of logging slash in Latvia, and the possibilities of utilizing it.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (177–82). 2 refs. [Russ.] N.L.L.

Discusses the amount of slash left after logging various species. Uses are in hydrolysis, cattle-fodder production, and for building materials. Machinery for bundling slash [cf. Latvia, *F.A.* 21 p. 687] is described.

1898. PUSTOVALOV, N. I., and MUTOVIN, JU. S. Mehaničeskij podborščik suč′ev. **[Mechanical slash collector.]** *Lesn. Prom.* 1960 (10), (11). [Russ.]

Describes a rake-type implement, mounted on the front of a crawler tractor, and used for pushing slash into heaps on felling sites.

1899. VASIL′EV, B. A., and FEDORENKO, V. N. Iz opyta mehanizacii lesoočistnyh rabot. **[Mechanized forest clearing.]** *Lesn. Prom.* 1960 (9), (5–7). [Russ.]

A general account of some heavy Soviet machinery for clearing sites of reservoirs and canals.

1900. SECKO, L. S. O zagotovkah pnevogo osmola. **[Harvesting resinous Pine stumpwood.]** *Gidrol. lesohim. Prom.* 13 (3), 1960 (16–7). [Russ.] P.R.

Studies were made to determine the damage to the surrounding young planted Pines caused by blowing up old Pine stumps with ammonite in order to obtain the resinous stumpwood. On an area of 0·5 ha., 170 stumps were blown up and mortality in the young stock was only 1·3%.

1901. ŠAHOV, G. N. Organizacija proizvodstva rubok uhoda pri mehanizirovannoj zagotovke drevesiny. **[Organization of mechanized thinnings.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (230–8). [Russ.russ.]

An analysis of work with the Družba power saw in thinnings and tending operations in a stand of Spruce and broadleaved species. The best organization of thinning gangs working with power saws is discussed.

1902. Rumancev, G. T. Rezervy povyšenija proizvoditel′nosti truda na rubkah uhoda. **[Increasing labour productivity in thinnings.]** *Lesn. Hoz.* 12 (8), 1960 (45–7). [Russ.]

Compares output with an ordinary 2-man cross-cut saw, a bow saw, and the Družba power saw, in thinnings removing 37 cu. m./ha. of Aspen and Birch (of mean diameter 16 cm.) from a Birch/Aspen/Spruce stand. An analysis is also made of the total time spent (preparations, actual work, rests, etc.) on each method. The power saw appears to offer most promise.

1903. Indan, R. Ju. Proizvoditel′nost′ ručnyh i motornyh pil na prohodnyh rubkah. **[Output of hand and power saws in thinnings.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (119–51). 6 refs. [Russ.russ.] N.L.L.

Compares conventional hand saws and bow-saws having various kinds of teeth, the Družba petrol-driven saw, and the K-5 electric saw, in felling, trimming and cross-cutting frozen and non-frozen Scots Pine, Norway Spruce and Birch. Output per worker was greatest with the K-5, then the Družba, and then the bow-saw, but the bow-saw was the best for Pine and Spruce ≯ 13–14 cm. diam.

1904. Mežals, Ja. V., and Indan, R. Ju. Iz opyta ėkspluatacii benzomotornoj pily "Družba" na rubkah uhoda. **[Trials using the Družba petrol-driven saw in thinnings.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (171–5). 4 refs. [Russ.] N.L.L.

Reports operations in stands of pure Pine (80 years), Pine with some Spruce and Birch (90), and Spruce with some Pine and Birch (90), in which 19–20% of the standing volume was removed. The technique of operating the Družba power saw, including the use of wedges, is discussed. No definite conclusions are drawn, but it is claimed that bow saws are more suitable for trees of small diameter.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 1902–3, 1916.

1905. Bol, M., and Gerritsen, A. G. Minutentabellen 1960 voor het vellingswerk van groveden en Japanse lariks. **[Time tables for felling [primary conversion and extraction] of Scots Pine and Japanese Larch, 1960.]** *Ned. Bosb. Tijdschr.* 32 (9), 1960 (307–27). [Du.e.g.*e.g.*]

Presents the completed tables for Japanese Larch and revised tables [cf. *F.A.* 20 No. 3238] for Scots Pine.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 1699, 1891, 1894, 1901–4, 1923, 2296.

1906. Ein neuer Waldschäler-Halbautomat. **[A new semi-automatic forest barking machine.]** *Holz-Zbl.* 86 (122), 1960 (1715). [G.]

With this machine, made by A. Bezner, Ravensburg, two men can completely bark 4-5 cu. m./hr. of wood of 10–12 cm. diam. Through a system of serrated wheels set in various positions for feeding the wood to and pressing it against, the knife disk and turning it, the barker can handle diameters of 4–18 cm. and lengths of 1–25 m. It is supplied on a two-wheeled trailer, or on bars for carrying, or fixed to a mounting, and with either a 15-h.p. electric or an 11-h.p. diesel motor.

1907. Kaneuchi, T., Niwa, T., and Sano, S. **[Studies on the barker for small logs. II. Results of operational tests and considerations.]** *J. Jap. Wood Res. Soc.* 6 (4), 1960 (161–5). 2 refs. [Jap.jap.e.*e.*] P.R.

Tabulates the results of trials of a prototype chain-type barker, developed by the authors, for barking Birch logs of 10 to 22 cm. diam. The barker is claimed to be particularly easy to handle and maintain, economical to run, and very efficient even with crooked logs.

1908. Indan, R. Ju., Jazon, A. Ja., and Briedis, V. Ja. Racionalizirovannye instrumenty lesopol′zovanija. **[Improved forest tools.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (115–8). [Russ.] N.L.L.

Describes a handsaw (with a guard for the blade when not in use), a special saw for removing bark when tapping Spruce, an axe with a cover for the head, and an axe with a pick point.

1909. Indan, R. Ju. Novoe v konstrukcii pil′nyh cepej. **[New ideas in saw-chain design.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (107–14). 4 refs. [Russ.] N.L.L.

Discusses some Soviet saw chains [cf. *F.A.* 19 Nos. 1806–7], foreign developments towards round-hooded teeth, and the sharpening of teeth.

1910. Mežals, Ja. V. Mehanizirovannaja zagotovka lesomaterialov vyboročnoj rubkoj v hvojnyh lesonasaždenijah. **[Mechanized logging in selection fellings in conifer stands.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (153–70). 7 refs. [Russ.russ.] N.L.L.

Compares performance with hand saws, the Družba power saw, and the K-5 electric saw. There was virtually no difference between output with the Družba and the K-5; with both, 2-man gangs were most economic.

1911. Vasil′ev, E. A., and Sirotin, K. S. Spiral′no-petlevaja sučkorezka. **[A spiral-loop branch-trimming saw.]** *Lesn. Prom.* 1960 (11), (19–22). [Russ.]

Describes, with drawings, the experimental APS 1 branch-trimming unit made by the Karelian branch of CNIIMĖ, which works on the same principle as, but is more elaborate than, one already described [cf. *F.A.* 19 No. 1808]. The spiral-loop blades, 1200 mm. long, are made of 4-mm. steel, twisted 106° on the helix. The fitting of a second cutting unit with blades 800 mm. long, immediately behind the first, was found to improve the quality of work. Conifers and hardwoods up to 30 m. long, and 80 cm. butt diam. can be handled; the minimum top diam. is 8 cm. The trees can be winched through the trimmer at speeds up to 3 m./sec., and branches up to 12–15 cm. diam. can be cut. Throughput per 7-hour shift is estimated at 200–250 cu. m.

1912. Rogozin, A. Sučkoreznyj agregat SevNIIP. **[The SevNIIP branch-cutter.]** *Lesn. Prom.* 1960 (9), (8–10). [Russ.]

Describes, with drawings and specifications, this electrically powered branch-cutter which is designed for integration into production lines at industrial log depots. Whole conifers are fed at 0·45 m./sec., butt first, to its rotary cutting mechanism, which can take branches up to 90 mm. diam. and works by remote control. Mean throughput per shift is calculated at 150–175 cu. m.

1913. Simons, S. J. **Development of a tailor-made mechanized logging program.** *For. Prod. J.* 10 (10), 1960 (503–5). 1 ref.

Describes pulpwood operations on the north shore of the St. Lawrence river in difficult terrain, and includes data on performance and costs of the Bombardier processing unit, the Vit feller-buncher, and the HDW Muskeg as a 4-foot bundle yarder [cf. *F.A.* 21 Nos. 3202, 4472, 4475, respectively]. Promising tests with the first named suggest that slightly increased pressure on the trimming jaws will allow 80% of the outer and 50% of the inner bark to be removed in one operation.

1914. **Revolution in pulpwood harvesting.** *Sth. Lumberm.* 201 (2506), 1960 (31–3).

Describes a demonstration of the prototype of the Busch Combine, developed by the International Paper Co. It consists essentially of a heavy tractor with four-wheel drive, on which are mounted two hydraulic shear-type cutter heads and a limbing [trimming] belt. After one cutter has cut the tree at the base, a steel arm lifts it on to a carriage which draws it first through the delimber [trimmer] and then to the second cutter for cross-cutting into 63-in. lengths. These fall into a cradle, from which they are dumped in a vertical bundle of ca. 1 cord and then bound with wire. Trees up to 19 in. diam. can be cut. Two men can cut and stack 16 cords in an 8-hour day. [Cf. *F.A.* 20 No. 1888.]

372/377. Land Transport

See also Nos. 1892–3, 1905, 1913–4, 2287–8.

1915. Bayoğlu, S. Çangal bölgesinde orman nakliyatı ve yol sistemi üzerine araştırmalar. **[A study on forest transport and the forest road network in the Çangal district.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (57–99). 71 refs. [Turk.e.*e*.]

An account of existing transport, including skidding, and of the planning of a new forest road network for the district, with details of costs.

1916. Simonen, T. Vertaileva tutkimus pinotavaran hevoskuljetuksesta hajamuodostelmista ja palstatien varresta. **[Comparative study on horse haulage of cordwood from dispersed formations and from the side of the strip road.]** *Metsät. Aikak.* 1960 (10), (353–8, 342). [Fi.fi.e.]

[Cf. *F.A.* 21 No. 3209.] The following conclusions were among those drawn from a comparison of *h* strips and *pv* strips (those where cordwood was made in dispersed formation or along the strip road respectively): (1) There was no appreciable difference between depth of *h* or of *pv* strips. (2) Stack size was 18% and load size 10% smaller on the *h* strips. (3) The ratio of haulage output for the basic distance (0–400 m.) was *pv* strips 100 : *h* strips 79·1. (4) The influence of stand density on output is greater than was presupposed in the wage agreement in N. Finland. (5) Haulage output is influenced by nature of the terrain, load size, and number of cordwood categories but not by stack size. (6) On the strips studied, the daily wage was higher for *pv* than for *h* haulage. *From author's summary.*

1917. Forsberg, G. Barmarkslunning—ett nytt redskap. **[Skidding over bare ground—a new vehicle.]** *Skogen* 27 (19), 1960 (361, 363). [Sw.]

The Swedish Myra logging wheels for horse skidding consist essentially of a metal frame fitted with three closely spaced axles, and 12 × 4-in. rubber-tyred wheels with a cross-bar between the middle and the last axles for supporting the logs. The vehicle has a length of 1·73 m., a loading width of 0·9 m., a capacity of 1600 kg., and a net weight of 110 kg. Runners can be substituted for the wheels in winter. [Cf. *F.A.* 21 No. 3230.]

1918. Steinlin, H., and Zehntner, K. **Experiments for the improvement of transportation of lumber in mountains. (I. Report).** *Transl. For. Timb. Bur. Aust.* No. 48, [1960?]. pp. 25. Transl. from *Mitt. Schweiz. Anst. Forstl. Versuchsw.* 29 (1), 1953 (131–68). [See *F.A.* 15 No. 2572.] Limited distribution.

1919. Káldy, J., and Papp, I. A kötéldarus közelítés új módszere a Zempléni-hegységben. **[A new method of cable-crane skidding in the Zemplén Mountains.]** *Erdö* 7 (6), 1958 (201–8). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (9–10). [E.] C.G.B.

Describes the installation and working of a 5-man cable crane, powered by a modified Russian KT-12 crawler tractor. This weighs 6000 kg., has a 4-cylinder, 40-h.p. diesel engine, consuming 4 litres fuel per hour, with a tractive force of 3·5 tons, and winches for the skyline (100 m. of 17-mm. diam.) and operating cables (350 m. of 7-mm. diam.). The method is independent of weather, saves 20% on manual and horse skidding and is more careful of natural regeneration.

1920. Binder, R. O výpočtoch lán lanovky Valtelina. **[Calculations on the cables of the Valtelin [gravity] cableway.]** *Lesn. Čas.* 6 (4), 1960 (275–85). [Slovak.russ.g.]

A calculation of cable strengths, stresses, etc.

1921. Knapo, A. Výpočet kotevného brvna lanoviek. **[Calculations on the anchoring log in**

cableways.] *Lesn. Čas.* 6 (5), 1960 (366–70). [Slovak.russ.g.]

Presents calculations to assist in determining log length and thickness, and the depth to which it should be buried.

1922. KAUFMANN, G. VON. **Small cable installations for timber-hauling.** *Transl. For. Timb. Bur. Aust.* No. 49, [1960?] pp. 11. Transl. from *Allg. Forstztg.* 69 (7/8), 1958 (95–100). [See *F.A.* 19 No. 4271.] Limited distribution.

1923. KOROLEFF, A. **Recent developments in logging mechanization and full-tree logging in Russia.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 118, 1960. pp. 18. 6 refs.

[Cf. *F.A.* 20 No. 4624.] The post-war reconstruction of logging in the U.S.S.R. is a fundamental revolutionary change from the old practice. It depends upon intensive work mechanization with considerable use of electric power, a change to year-round operating with permanently employed labour, and a number of other important developments. Its unique feature, however, is the application of full-tree [whole-tree] logging. The work usually performed at the stump, under intrinsically adverse conditions, can thereby be transferred to a landing, or even to the logging terminal, where the possibilities for mechanization and partial automation of timber handling and processing are the most favourable. This system also helps to eliminate waste by permitting fuller use of trees. While experience elsewhere with full-tree logging is almost entirely lacking, except on an experimental basis, Russia is advancing rapidly towards making this its standard logging practice. Returns from the great effort and funds expended in reconstruction of Russian logging were slow in coming. Work productivity is now double that of 1946, yet is still far below the N. American level. However, the rate of its increase has been very rapid since 1957. Logging costs, after increasing greatly at first, have been diminishing during the last three years. After the protracted period of hard spade-work, the reconstruction is now showing increasingly gratifying results and is proceeding vigorously. *From author's summary.*

1924. KREUTZINGER, M., and MATUSZ, S. Pozyskiwanie surowca drzewnego w postaci całych drzew. **[Harvesting whole trees.]** *Las Polski* 34 (19), 1960 (10–5). [Pol.]

Describes a technique whereby a special strong framework, mounted on two wheels or two skids, is chained to the base of the tree. It acts as a kind of fulcrum when the tree is uprooted and pulled over by a tractor hauling on a cable attached some way up the stem. As the butt end of the tree is still chained to the mobile framework after being uprooted, and is resting on it, the whole tree can then be hauled away very easily. The results of trials on Pine, Oak, Beech, Aspen, Birch etc. (15–90 cm. diam., 10–35 m. high), using several different makes of tractor, are discussed. Preliminary indications are that the method is promising.

1925. BAKER, T. N. **Integrated utilization via tree-length pulpwood logging.** *For. Prod. J.* 10 (8), 1960 (389–91).

Describes operations in Slash and Longleaf Pine forest in Georgia, in which the trees, usually representing heavy thinnings of ca. 4½ cords/acre, are conveyed to the mill whole after trimming. There they are scaled by weight, barked, and sorted or cut into sawlogs, poles or (the majority) pulpwood. A typical gang of 9 men usually produced 50–60 cords a day, compared with a mean rate of 1¾ cords of 5 ft. 3 in. pulpwood per man-day by standard methods.

1926. THOMSON, J. G. **Muskeg and transportation.** *Pulp Paper Mag. Can.* 61 (10), 1960 (184 . . . 191). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1997 (*B–8–a*).)

Discusses the problems of timber transport over muskeg, and describes the prototype Musk-Ox, a long, bellyless crawler vehicle exerting a low pressure on the ground and with controlled-joint articulation. Performance during two seasons is reported (the machine could take a 25-ton payload over muskeg where even walking was hazardous), and the economics of Musk-Ox operation are discussed; also, briefly, the possibilities of using machines with very large wheels for transport over muskeg.

1927. SEHEULT, I. R. **The use of small tractors in logging.** *Pulp Paper Mag. Can.* 61 (10), 1960 (191–3). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2000 (*B–8–f*).)

Recommends: the revision and standardization of logging terminology; setting up a simple, practical system of terrain classification; and an equipment-testing program. It is thought that the market for small tractors will probably expand, and that a crawler with bogie action and using rubber tyres on steel track [cf. *F.A.* 20 No. 1895] would, at the right price, enjoy a good market.

1928. SHEARSMITH, G. V., and MCNALLY, J. A. **The BM Bamse tractor.** *Pulp Paper Mag. Can.* 61 (10), 1960 (198–9). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2002 (*B–8–f*).)

A report of tests (454 hours) on this Bolinder-Munktell crawler tractor fitted with Alfta tracks [cf. *F.A.* 20 No. 1895] in transporting 4-ft. pulpwood, stacked at stump, in a 4-wheeled rubber-tyred semi-trailer.

1929. RADZIMIŃSKI, S. Próby zastosowania ciągnika Ursus C-325 do zrywki drewna. **[Trials with the Ursus C-325 tractor for timber skidding.]** *Las Polski* 34 (15/16), 1960 (26–8). 1 ref. [Pol.]

The tractor, fitted with a special attachment for the skidding tongs, performed quite successfully even though it is designed primarily for agriculture.

1930. SOINÉ, H. Das Förderwesen in der Holzindustrie—Siebente Mitteilung: Forstwirtschaft. **[Transport systems in the woodworking industry, VII. Forestry.]** *Holz Roh- u. Werkstoff* 18 (10), 1960 (386–90). [G.g.e.] P.R.

Tractors, trailers, loading devices, etc., mainly of German make, for use in extraction.

1931. KOLOSKOV, V. N., and NAUMOV, B. P. Navesnye brevnozahvaty k traktoram. [**Tractor-mounted log grabs.**] *Lesn. Prom.* 1960 (10), (24). [Russ.]

The grab consists essentially of a rocking cradle with forks, mounted on the rear of a TDT-40 crawler tractor. The tractor reverses up to the log stack with its cradle down, so that the forks dig well into the stack; the cradle is then pulled back by the tractor's winch, and the tractor moves away carrying a 3-cu.m. pile of 2-m. logs in its cradle.

1932. OSIPENKO, I., and SOLOV'EV, V. Čeljustnye pogruzčiki na traktorah S-80 i S-100. [**Grab loaders on S-80 and S-100 tractors.**] *Lesn. Prom.* 1960 (11), (23–6). [Russ.]

Describes, with illustrations, specifications and performance data, the SibNIILHÉ and the P-10 grab loaders, both of which have a lifting capacity of 4 tons and are designed for handling tree-length logs.

1933. Tømmersaks for bilkraner. [**Timber tongs for lorry cranes.**] *Inform. Skogbr. Skogind. Forskn-Foren.* (*Transportutv.*) No. 89, 1960. pp. 2. [Nor.]

Describes a Swedish model fitted with a coiled spring that loosens the grip of the tongs as soon as the cable to which it is attached is slackened, thus making it unnecessary for a man on top of the load to free the logs. There is also a locking device that prevents the tongs slipping before the cable is tightened for hauling, but opens automatically as soon as the cable is taut.

1934. TRUSOV, V. P., and KOMAROVSKAJA, A. S. Teplovozy—ėkonomičnyj vid tjagi. [**Diesel locomotives—an economic form of traction.**] *Lesn. Prom.* 1960 (9), (13–5). [Russ.]

Gives specifications of 5 Russian makes, and performance data when hauling timber on narrow-gauge railways. Diesels proved more economic to run than steam locomotives.

378. Water Transport

See also Nos. 1892, 2366.

1935. Pohjois-Suomen uitto-olojen järjestelykomitean mietintö. [**Report of the organizing committee for timber floating in Northern Finland.**] *Silva fenn.* No. 102, 1959. pp. 53 + 7 maps and plans. [Fi.e.]

Makes recommendations for government-subsidized improvement of floating channels and a change-over from loose to bundle floating, in order to increase the exploitation of the forests of N. Finland.

1936. RAMENSKIJ, A. N. Novaja tehnologija zimnej splotki. [**A new technique in bundle assembly in the winter.**] *Lesn. Prom.* 1960 (9), (21). [Russ.]

Describes a special movable ramp (1·1–1·2 m. high, 10–11 m. long, 3·2 m. wide, slope ≯10–11°) which is placed at the end of a log stack; a tractor reverses up the ramp and, with its rear shield-plate, pushes the logs into bundles.

1937. PERTOVAARA, H. Lyhyen pinotavaran niputus vedessä. [**The bundling of water-borne short timber.**] *Metsät. Aikak.* 1960 (10), (345–52). [Fi.e.*e.*]

The Mustonen-Suorsa bundling machine was in use throughout the summer of 1960 on the Kemi river and has proved satisfactory; it makes 2-m. logs into bundles of 6 cu. m. stacked measure, is cheap, can be operated by two men, and should reduce bundling costs. The Kivelä and Rouhiainen machines have both also given good results in making double bundles. A new machine has been developed on the Kemi River for turning the logs into parallel lines; it is cheap and labour-saving, and can also be used for long timber. [Equipment described is illustrated.] *From author's summary.*

1938. HUGHES, J. R. **Portable flow adapter.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2011 (*B*–9–*c*), 1960. pp. 3.

Describes and illustrates two current-makers (10 and 25 h.p.) for increasing the sluicing capacity of small dams and for reducing labour requirements in sluicing.

1939. SÖDERLUND, J. A. Undersökning av uppvattningsaggregat för ispreparering. [**Tests of pumping equipment for ice strengthening.**] *Norrlands SkogsvFörb. Tidskr.* 1960 (3), (291–330). 2 refs. [Sw.e.*e.*] (*Meddelanden från Mellan- och Sydsvenska Skogsbrukets Arbetsstudier* (MSA) No. 11.)

[Cf. *F.A.* 21 No. 1897.] Reports in greater detail the performance of various models of the Kaskad, Tyfon and Companion pumps (propeller- or screw-type) as regards rate of delivery, area of throw, and ice drilling, in relation to thickness of ice, snow conditions, temperatures, height of lift etc. The medium and small machines (capacity 2·5–5 cu. m./min.) are considered preferable for thin ice, and for preparing roads for light traffic. The heavier types (10 cu. m./min.) are often better for preparing large landings.

38. Forest Engineering

381. Materials (including Explosives)

See No. 1900.

382. Buildings

1940. BALOD, N. Toplotna izolacija manjih šumskih zgrada u vezi sa uštedom ogrevnog materijala. [**The heat insulation of smaller forest buildings in relation to fuel economy.**] *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 12, 1958/1959 (1959), (207–61). 4 refs. [Serb.russ.]

Discusses, with fully tabulated and illustrated theoretical and experimental data, the importance of thorough insulation and protection from wind; in Jugoslavian conditions, the extra cost of this is soon repaid by fuel economies. In illustration, building costs, heat loss, and fuel consumption are compared for (*a*) a standard M-72 forest worker's house and (*b*) an improved insulated version (constructional plans given). The higher cost of (*b*) is amortized in 8·5 years using wood, and 6 using coal, as fuel. Insulation also improves living conditions and capacity for work.

383. Roads and Bridges

See also Nos. 1700, 1915, 1939, 2270.

1941. Sonderheft Waldwegebau. [**Special number: forest road-building.**] *Forst- u. Holzw.* 15 (19), 1960 (381–404). Many refs. [G.]

Collected papers: Sales promotion through suitable methods of getting the timber ready in the forest (*E. Volkert*, *E. Meyer*, and *E. Schulte*) [i.e. by having the timber at the sides of good forest roads for easy loading and transport]; Road use maps (*Kiesekamp*) [showing road use in cu. m. per year/km.]; Report on road stabilization in Forstamt Kastellaun, 1959 (*F. Hachenberg*) [including the use of Lavalit, a porous kind of stone of volcanic origin]; Hygroscopic salts as aids in soil stabilization (*N. v. Diest*); Sloping posts (*G. Reissinger*) [pointing out the advantages of outward sloping (as opposed to upright) posts at road edges, in enabling vehicles to use the full width of the carriageway].

1942. Waelti, H. Die Planung und Projektierung von Waldaufschliessungsstrassen in Britisch-Kolumbien. [**Planning and lay-out of forest roads in British Columbia.**] *Schweiz. Z. Forstw.* 111 (9/10), 1960 (488–507 + 2 photos). 3 refs. [G.f.]

Discusses, partly on the basis of the (unpublished) Survey Manual of the Engineering Services Division, B.C. Forest Service, general planning, computation of optimum density of main and subsidiary roads, aerial and field reconnaissance, and lay-out on the ground, including gradients, curves, widths, profiles, survey methods, etc.

1943. Aḱimovski, R. Eden uprosten metod za proektiranje na šumski patišta. [**A simplified method of forest road planning.**] *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 12, 1958/1959 (1959), (173–206 + 2 dgms.). 17 refs. [Maced. *g.g.*]

Proposes a simplified and time-saving method of planning and building forest roads, on the basis of experience with ca. 10 km. of forest road made in Macedonia in 1958, which has proved suitable for lorry transport.

1944. Hafner, F. Vermeidung von Schäden unterhalb der Trasse beim Bau von Hangwegen. [**Preventing damage below the road line when building roads on slopes.**] *Allg. Forstztg.* 71 (19/20), 1960 (215–20). [G.]

Discusses widths of road cutting in relation to slope of ground permissible without use of reinforcing structures, if excessive spoil and damage to stands by sliding gravel or stone are to be avoided. The use of walls and fences to protect the stands below is also discussed.

1945. Gottwalt, F. Rationelle Instandsetzung und Pflege sandgeschlämmter Schotterdecken auf Waldwegen. [**Efficient repair and maintenance of sand/gravel surfaces on forest roads.**] *Forsttech. Inform., Mainz* 1960 (10), (76–8). [G.]

Describes the 'Schwarzwald', a two-wheeled multipurpose trailer for use with vehicles of ⩾25 h.p. Tines at its forward end loosen the road surface and a grader blade at the back distributes the material evenly and restores the profile. Both tines and blade are adjusted by a spindle setting to the requirements of the moment by an operator on the trailer. Performance per 8-hour day varies from 2·5–4 km. for remaking a profile to 10–12 km. for distributing additional gravel.

4. FOREST INJURIES AND PROTECTION

1946. Bärner, J. Bibliographie der Pflanzenschutzliteratur 1953. [**Bibliography of plant protection literature for 1953.**] Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1960. pp. xli + 527. [G.E.F.]

Comprises >15,000 classified titles including >1000 on forest species and wood protection. [Cf. *F.A.* 21 No. 1908.]

41. General Technique of Forest Protection. Types of Injury

1947. Mesnil, L. P., Pschorn-Walcher, H., and Zwölfer, H. Gegenwärtige Versuche zur biologischen Bekämpfung von Pflanzenschädlingen europäischer Herkunft. [**Present researches into the biological control of plant pests of European origin.**] *Anz. Schädlingsk.* 33 (9), 1960 (129–33). 22 refs. [G.]

A brief review of the work of the European Station of the Commonwealth Institute of Biological Control, Delémont, Switzerland, since its inception.

1948. Simmonds, F. J. **Report on a tour of Commonwealth countries in Africa, March–June 1960.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., England. 1960. pp. 98.

A tour was made by the Director of the Commonwealth Institute of Biological Control, in order to discuss the possibility of increased utilization of biological control of weeds and insect pests. The countries visited were Uganda, Tanganyika, Zanzibar, Kenya, S. Rhodesia, Union of S. Africa, Basutoland, Swaziland, Nigeria, Sierra Leone and Gambia. Visits were also made to Angola and Lourenço Marques.

1949. Gruppenbezeichnungen für Pflanzenschutzmittel. [**Group names for plant protection preparations.**] *Merkbl. Biol. Bundesanst. Land- u. Forstw., Braunschw.* No. 20, 1960. pp. [10]. [G.]

An alphabetical list of 60 common German names, with their chemical names and formulae, English, American and French equivalents, and the common names adopted by ISO, with a coded indication of their use. [Cf. *F.A.* 20 No. 636.]

1950. Polyakov, J. M. [Poljakov, I. M.]. **On the system and character of measures of diseases and**

pests control, and on their influence on [the] biocenosis. [*Proc.*] *IX International Conference on Quarantine and Plant Control, Moscow* 1958. pp. 15. [E.] (There is also a Russian version of the paper.) I.M.I.

A general discussion on the effect of chemicals used for insect, weed and rodent control, on useful insects and mammals. [Cf. *F.A.* 21 No. 582.]

1951. Žuravlev, I. I. Ustanovlenie pričin poburenija hvoi indikatornym sposobom. **[Determining the cause of needle browning by an indicator method.]** *Lesn. Hoz.* 12 (5), 1960 (39–41). [Russ.]

Exploiting the fact that the cell-sap of dying needles differs in pH according to the cause (drought, snow mould, burning, etc.), a method was devised of using various chemical pH indicators (Congo red, methyl red, etc.) to indicate the cause of needle browning. The method is cheap and rapid, and said to be reliable.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

See also Nos. 1553, 2079.

1952. Fromsejer, K. Egekapper. **[Edge plantings of Oak.]** *Hedeselsk. Tidsskr.* 81 (13), 1960 (294–301). [Dan.] C.G.B.

Describes some Danish examples, where Oak mixed with other hardwoods or with *Pinus mugo* has been successfully used in belts round the edge of conifer plantations to protect them against storm damage.

1953. Hofmann, W. Beobachtungen über die Windwurfgefährdung der Rotbuche auf der Fränkischen Platte. **[Observations on the danger of windthrow of Beech on the Fränkische Platte.]** *Forstwiss. Cbl.* 79 (7/8), 1960 (202–6). 7 refs. [G.]

Discusses the soil profiles of brown-earth pseudogley sites where several big Beech trees were uprooted by wind. In each case the main root mass of the Beech was restricted to the top 30 cm. of soil. Pure Beech should be avoided, and recommendations are made on choice of species for such sites—e.g. Oak, and particularly Scots Pine; Beech can form part of a mixture on sites where pseudogleys are not too strongly developed.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 1404, 1437, 1441, 1515, 1517–9, 1572, 1773, 1821.

1954. Kučinskij, A. F. Vlijanie mikroèlementov na povyšenie morozoustojčivosti barhata amurskogo v uslovijah BSSR. **[The effect of trace elements in increasing the frost resistance of *Phellodendron amurense* in Belorussia.]** *Lesn. Hoz.* 12 (7), 1960 (18). [Russ.]

The following were applied to plots of 1-year *P. amurense*: B (0·6 and 1·8 kg./ha.), Mn (1·8 and 5·4), Zn (0·6 and 1·8), Cu (0·6 and 1·8), and lime (3600 and 7200). Seedling dimensions and frost resistance were determined for three years. All the treatments appeared to result in greater frost resistance than in controls. [Cf. *F.A.* 20 No. 4709.]

1955. Ranquet, du. La gelée et le pin maritime. **[Frost and *Pinus pinaster*.]** *Rev. for. franç.* 12 (11), 1960 (710–3). 3 refs. [F.]

Since the *P. pinaster* stands of the Sologne were almost destroyed in the winter of 1879, this formerly popular species has been little planted there. The author examines contemporary accounts, and concludes that the conditions were so exceptional—a very severe glaze storm in January and a severe frost (temperatures falling suddenly to −28 or −35° C.) in the following December—that the disaster need not be regarded as a complete contra-indication for this species.

1956. Dumont, J. J. **Norway Maples get hardiness test in Montreal region.** *Trees Mag., Ohio* 20 (6), 1960 (10–11, 22).

Describes damage caused by late frosts (16–21 May) to *Acer platanoides*, both in the nursery and planted out as street trees in Montreal. It is concluded that this species is not suitable for planting in this region.

1957. Orlov, F. B., and Soveršaev, P. F. Mery bor′by s vyžimaniem sejancev na Severe. **[Measures for controlling frost-heaving of seedlings in the N. of the U.S.S.R.]** *Lesn. Hoz.* 12 (7), 1960 (41–3). [Russ.]

An account of investigations on *Larix sukaczewii*, *Pinus sylvestris*, *P. sibirica*, and *Picea abies* in the Archangel region, indicating that: transplants suffered less than direct sowings; soaking seeds before sowing increased the resistance of the plants to frost-heaving; autumn sowings were the least affected by heaving (though they produced fewer seedlings than spring and summer sowings); Spruce suffered worst, then Scots Pine, then the Larch, and the Siberian Pine least; loosening the soil increased, and thin moss cover reduced, damage from heaving.

1958. Simpson, A. W. **Notes on the drought crack of Noble Fir and Grand Fir in Northern Ireland during 1959.** *Forester, N. Ire.* 1 (6), 1960 (19–21).

No *Abies nobilis* of <23 years is reported to have suffered, and in a 33-year stand most trees affected are >8 in. q.g.b.h. A relationship between site incidence of damage was noticed for *A. grandis*, ca. 40% of trees on sloping, stony sites having drought cracks, while few of those on a deep, porous soil along a river bank had any.

1959. Haig, R. A., and Cayford, J. H. **Factors affecting survival and growth of Red Pine plantations in southeastern Manitoba.** *Tech. Note For. Br. Can.* No. 93, 1960. pp. 17. 13 refs.

Between 1927 and 1958, over one million Red Pine were planted on the Sandilands Forest Reserve. In 1958, 41 plantations totalling 229 acres, set out between 1931 and 1946 on dry, sandy soils were examined. Taking 400 trees/acre as representing satisfactory stocking in 1958, 26% of the planting was successful, 42% if burnt portions are excluded. Apart from fire, drought during the first growing season after planting was the chief cause of failure. Height growth was also affected by precipitation, and was slower in the decade 1931–40, when the average growing-season precipitation was below normal, than in the decade 1941–50 when it was above normal. A partial overstorey of Jack Pine increased survival but reduced height growth by suppression. Young Jack Pine of about the same age as the planted trees outgrew the latter substantially but did not appear to have suppressed them. The presence of a calcareous gravel layer close to the surface reduced survival and growth in a few plantations. The over-all performance was below average for Red Pine throughout most of its range. While some of the difference was undoubtedly due to unfavourable climatic conditions, the excessively dry planting sites were at least partly responsible. However, the surviving plantations showed good form and health and there is every reason to believe that where stocking was adequate they will develop into satisfactory merchantable stands. Future plantings of Red Pine should probably be concentrated on somewhat moister sites. Some suggestions are made for improving the results of planting on dry sites. *From authors' summary.*

423. Precipitations

See also Nos. 1955, 2042.

1960. KADLUS, Z. K otázce námrazy v Orlických horách. **[The hoar-frost problem in the Orlické Mts.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (155–79). 15 refs. [Cz.russ.g.]

Studies damage by hoar frost to Spruce crowns in stands of age class V (and a few older and younger stands) at altitudes up to 1114 m. Hoar-frost damage increased with altitude, especially on exposed sites. To reduce it, mixed uneven-aged stands should be established, using the progeny of trees that have proved themselves resistant under these conditions; in some places Beech, Maple or Rowan can be introduced. In afforestation, a maximum density of 2500 Spruce/ha. is suggested; the necessity for a nurse (Rowan) is stressed.

1961. JOACHIM, H. F. Über Hagelschäden an Pappeln. **[Hail damage to Poplars.]** *Arch. Forstw.* 9 (3), 1960 (259–65). 2 refs. [G.russ.e.]

Hail damage in the cases observed had usually not led to secondary infections, and when it occurs early in the season the lesions are soon occluded. Instances are given, however, of these lesions admitting *Sciapteron tabaniforme* and bacterial canker (*Pseudomonas tumefaciens*). Important damage is also done to green shoots, resulting in deformation and forking in the main stem. Damage to larger stems and its effect on veneer wood are discussed. [Cf. *F.A.* 18 No. 1217.]

424. Soil Conditions; Erosion Effects

See also Nos. 1578, 1970, 2179.

1962. MATERNA, J. Příspěvek k otázce výživy smrku na šumavských rašeliništích. **[The nutrition of Spruce on raised peat-bogs in Bohemia.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 6 (6), 1960 (495–504). 14 refs. [Cz.russ.g.]

Results of chemical analyses of needles (various ages) from poor, sickly Spruce growing on a peat-bog are tabulated and graphed. N content was $<1\%$ (dry matter) in 1-year needles. A content of 1% N is regarded as the limit below which deficiency symptoms become visible. The needles were also deficient, but not so critically, in P and K. The SiO_2 content was surprisingly high. Analysis of water extracts revealed that less K and N were extracted than from needles on healthy trees. Further investigations are required to determine whether N deficiency is due to the lack of available N in an environment rich in the element, or to the inability of the Spruce to absorb N on the very wet site.

1963. POUTSMA, T. **Soils of Waarre Plantation, Port Campbell, and some observations on their relation to Pine growth.** *For. tech. Pap. For. Comm. Vict.* No. 4, 1960 (1–10 + 1 map). 4 refs.

As part of a programme to investigate the widespread failure (checking) of *Pinus radiata*, *P. pinaster*, *P. muricata*, *P. nigra* var. *calabrica*, and *P. caribaea*, a soil survey of Waarre Plantation [Victoria] was made during 1958 in which ca. 2000 acres were mapped in detail and 4 major and 8 minor soil types recognized. While some broad relations between tree growth and soil type emerged, they were not sufficiently marked to account fully for the variation in tree growth, and the results suggested that superficial waterlogging at a critical time of the year could be an important limiting factor. *From author's summary.*

1964. BIRCH, J. N. **Some soil testing under *Pinus radiata* (D. Don) at Waarre Plantation.** *For. tech. Pap. For. Comm. Vict.* No. 4, 1960 (11–2).

[Cf. preceding abstr.] Following the failure of the crop to sustain initial satisfactory development on ca. $\frac{4}{5}$ of the net area of 516 acres occupied by *P. radiata*, five core-auger drillings were made in each of five plots within sections of the above area that were selected for sampling under stands of differing quality so that variations of slope, scrub cover, and surface moisture were avoided as far as possible. Cores at depths of 2–6 and 21–26 in. were taken as representative of topsoil and subsoil fractions respectively, the range of results for soil reaction being so limited that there was no apparent correlation between pH and stand quality. As regards the total soluble salt content, the results indicated that toxic levels of chlorides did not occur under poorer-quality stands, the higher salt contents occurring in soils under good-quality stands. Neighbouring agricultural and pastoral land of broadly similar soils was top-dressed fairly successfully with commercial superphosphate, and it is suggested that the poor soils of the plantation area may lack essential trace elements and possibly phosphates, and that subsequent trials with trace elements should embrace newly planted stock, since older checked trees might not respond to site treatment.

1965. ATKINSON, I. A. E. **Soils and the growth of *Pinus radiata* at Cornwallis, Auckland.** *N.Z. J. Sci.* 2 (4), 1959 (443–72). 20 refs.

A detailed survey showed that stunted Pines were associated with a particular soil type, the Cornwallis silted clay, classified as a strongly leached brown granular clay, and weathered from andesitic tuffaceous sediments. From an experimental investigation it was concluded that stunted growth had resulted from P starvation due to restricted root growth. Inferior soil aeration associated with weak development of soil structure appeared to be the primary factor restricting root growth. *From author's summary.*

425. Chemical Influences (Atmospheric)

1966. PEŠEK, F. Lenticely jako indikátory kouřových zplodin v ovzduší. **[Lenticels as indicators of atmospheric smoke pollution.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 6 (5), 1960 (365–74). 4 refs. [Cz.cz.russ.e.]

Describes the structure of, and seasonal changes in, lenticels; the penetration of smoke particles into them; and the possible use of *Sambucus nigra* (the lenticels of which are filled with merenchymatous tissue highly sensitive to smoke pollution) as an indicator of the intensity of atmospheric pollution.

1967. BERGE, H. Durch Schwefeldioxyd bedingte Immissionsschäden an Obst- und Waldbäumen. **[Injuries to fruit and forest trees by SO_2.]** *Gartenbauwissenschaft, München* 24 (2), 1959 (220–8). 17 refs. [G.g.e.f.] E.M.B.

A general discussion of the problems involved, including observations in the N. part of the Rhine-Westphalia industrial area. In smoke-damaged Scots Pine, Beech, Birch and Rowan, standing on the edge of woodlands facing a smoke source 1000 to 2000 m. away, SO_2 contents (% of dry matter) were invariably higher than, and sometimes more than twice as high as, in trees on the other side of the same woodlands, never >250 m. distant, which showed little or no damage. In these species, SO_2 contents were lowest between June and Aug. and highest in Sept. or Oct., a fact thought to be connected with fluctuations in the SO_2 content of the atmosphere.

1968. THEMLITZ, R. Die individuelle Schwankung des Schwefelgehaltes gesunder und rauchgeschädigter Kiefern und seine Beziehung zum Gehalt an den übrigen Hauptnährstoffen. **[The individual fluctuations of S content in healthy and smoke-damaged Scots Pine and the relations between S content and contents of other major nutrients.]** *Allg. Forst- u. Jagdztg.* 131 (11), 1960 (261–4). 2 refs. [G.g.]

On 4 average sites in E. and W. Germany, not subject to smoke damage, the S content of 1-year-old needles averaged 0·15% of dry matter (varying from 0·11 to 0·18%). There was no correlation with age, nor with contents of other nutrients. In a smoke-damaged, but otherwise similar stand, healthy-looking individuals had much less S than similarly exposed chlorotic ones. In another, where the S contents of 78 trees ranged from 0·14 to 0·29% (48 of them >0·18%), there was no discernible pattern of spatial distribution nor was there any correlation with Ca, N and P contents. Only Mg and K appeared to have a tendency to rise with rising S.

1969. JAMRICH, V., and PAGAN, J. Účinky továrenských dymových plynov na rast a vývin listových čepelí niektorých lesných drevín. **[The effect of industrial atmospheric pollution on the growth and development of the leaf blade in some forest trees.]** *Lesn. Čas.* 6 (6), 1960 (422–34). 12 refs. [Slovak.slovak.russ.g.]

A study of the biometrical variability of needles of *Pinus sylvestris* and of leaves of *Quercus sessiliflora, Carpinus betulus* and *Fagus sylvatica* exposed to factory smoke containing F and SO_2. Air pollution caused Pine needles to be longer and thinner than normal; though it appeared to stimulate growth in leaf width in deciduous trees, particularly in the early stages, the leaves did not ultimately reach normal size. Leaf shape did not change significantly, but spoon- and tube-shaped deformations and marked xeromorphism of the leaf tissues were noted.

426. Electrical and Cosmic Influences

See also No. 1977.

1970. STEFIN, V. V. K voprosu o vlijanii vulkaničeskih otloženij na lesnuju rastitel′nost v central′noj časti doliny r. Kamčatki. **[The effect of volcanic deposits on the forest vegetation in the central part of the Kamchatka river valley.]** *Dokl. Akad. Nauk SSSR* 133 (4), 1960 (947–9). 7 refs. [Russ.] A.P.B.

Discusses briefly the effects on *Larix gmelinii/Betula japonica* forests of volcanic ash derived from eruptions of 1955–56 and deposited by spring flood-waters round about a normally dry watercourse. Many trees 20–40 years old died, and only a few individuals of *B. japonica* and *Lonicera edulis* survived. The greatest mortality occurred where the finest ash (possibly with a high content of absorbed gases) had been deposited. Natural leaching makes such sites habitable again by forest vegetation after a time.

43. Forest Fires

1971. ČARKINA, A. P. Razvitie lesnogo požarovedenija. **[Development of forest fire control.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (157–67). [Russ.]

A general review of work in the U.S.S.R. from 1932 to the present, dealing particularly with fire-danger ratings.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

1972. OLSEN, J. M. **1959 green-fuel moisture and soil moisture trends in southern California.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 161, 1960. pp. 8. 11 refs.

Presents data from weekly records of (*a*) soil moisture, (*b*) green-fuel (*Adenostoma fasciculatum, Ceanothus crassifolius, Salvia mellifera*) moisture, and (*c*) precipitation, on a typical S. slope in chamise/chaparral vegetation at 3100 ft. alt. at Bell Canyon, San Dimas Experimental Forest. A good correlation was found between (*a*) and (*b*). Short-term weather fluctuations had an appreciable effect on (*b*). Further study of (*b*) is needed to establish its relationship to (*a*), (*c*) and other weather variables. [Cf. *F.A.* 21 No. 3278.]

1973. FRANSSILA, M. Kulovaaran ja säätekijöiden välisestä riippuvuudesta. **[The dependence of forest fire danger on meteorological factors.]** *Acta for. fenn.* 67 (5), 1958 (1959). pp. 26. 9 refs. [Fi.e.*e*.]

The moisture content of Pine needles, moss, and wood cylinders placed on the ground in a *Vaccinium*-type Pine stand was compared experimentally with the air temperatures and humidity at 15 cm. Correlation was good for wood cylinders, slightly poorer for needles and moss. A statistical study was based on meteorological observations at Sodankylä observatory, 1924–43, and forest fire data from an area of 3·56 million ha. round Sodankylä (Finnish Lappland). Days were taken into account only if they had a 24-hour precipitation of <1 mm. and the preceding day had <2 mm. The days satisfying this condition were divided into 8 groups according to the relative humidity at 2 p.m. Each group was subdivided into 5 further groups according to the temperature at 2 p.m. Thus each day was classified as belonging to one of 40 temperature-humidity groups. Assuming that one of these groups has n_1 days with and n_2 days without a forest fire, the ratio $K = n_1/n_1 + n_2$ states the probability that at least one forest fire will occur at Sodankylä on a day belonging to this group. The ratio *K* (forest fire danger index) was calculated for each temperature/humidity group, and its dependence on temperature and humidity determined with the aid of these values. A diagram is given which simplifies the calculations of *K* for a given temperature and humidity. To obtain an idea of the pattern of forest fire danger, values for *K* were determined at 4 meteorological stations in different parts of Finland, using observations made in 1927–36. It appears that, though the number of days in which $K > 0{\cdot}1$ decreases when proceeding northwards, because of the shortening summer, yet the number of days in which $K > 0{\cdot}3$ increases towards the north. According to observations in Helsinki, the sea significantly diminishes the danger of forest fires in the coastal area.

1974. CASTELLANOS, O., and PAPARA, A. **Tables of fire danger.** *Transl. For. Timb. Bur. Aust.* No. 45, [1958?] pp. 10. Transl. from *An. Adm. Nac. Bosques, B. Aires* 1956 (143–76). [See *F.A.* 18 No. 554.] Limited distribution.

1975. KURBATSKIJ, N. P. Pričiny izmenenij intensivnosti lesnyh požarov v tečenie sutok. **[Reasons for the change in the intensity of forest fires during the day.]** *Lesn. Hoz.* 12 (4), 1960 (31–3). [Russ.]

Discusses diurnal changes in the air temperature, fuel moisture content, O content of the air, and wind, and their effect on the intensity of a fire in Scots Pine.

432. Prevention and Control

See also No. 1628.

1976. ISENOR, M. G.; MCDONALD, J. A. D.; GAYLE, W. B. **The organization and integration of industrial and government agencies for fire control in managed forest units.** *For. Chron.* 36 (2), 1960 (118–25).

Three papers presented as part of a panel discussion at the 1959 annual meeting of the Canadian Institute of Forestry: (1) The pre-training of fire-suppression personnel; (2) Development of employee training and co-operative planning; (3) Co-operative fire prevention and control.

1977. ROBINSON, L. H. **An evaluation of three seasons of anti-lightning operations in California.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 169, 1960. pp. 8. 1 ref.

Analyses operations in seeding clouds with AgI from the ground or from aircraft in N.E. California in 1957–59. Conclusions from those operations which were statistically controlled, were that seeding from the ground did not significantly increase or decrease precipitation or the incidence of lightning fires, but in 1959 did significantly increase the mean number of ice nuclei "active" at ca. −18° C. near cloud base levels, within and around the lightning fire target. [Cf. *F.A.* 20 Nos. 1938–9.]

1978. HALLS, L. K., HUGHES, R. H., and PEEVY, F. A. **Grazed firebreaks in Southern forests.** *Agric. Inform. Bull. U.S. Dep. Agric.* No. 226, 1960. pp. 8.

Based on research in the coastal-plain Pine lands of N. Carolina, Georgia and Louisiana. Location, clearing and land preparation (soil cultivation and burning), suitable forage plants, fertilizing, sowing and planting, and intensity and timing of grazing are discussed.

1979. MACLEOD, J. C. **A new forestry-hose folder.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 91, 1960. pp. 6 + 1 set of drawings.

Describes, and explains the simplified operation of, the Mark II hose folder.

1980. KORNIL′EV, N. V., and HUDONOGOV, JU. A. Malogabaritnyj šnekovyj pokrovosdiratel′. **[A small screw-type cover-stripper.]** *Lesn. Prom.* 1960 (9), (11–3). [Russ.]

Describes, with drawings etc., the implement (based on the Družba power-saw) which is for clearing a strip of ground down to the mineral soil in fire control. With the stripper a man can cover 1·25 km./hr.

1981. LEMBCKE, L. W. **Tractor-plow line burning device.** *Fire Control Notes* 21 (4), 1960 (112–4).

Describes the installation of an automatic burning device on a standard trailed plough, which is controlled by the tractor driver by the operation of a switch. The fuel is propane gas. This combination of ploughing and burning in one operation is a great improvement on current practice, in which a line can be ploughed several times as fast as the line-holding crews can burn the adjacent vegetation, which is necessary to make it effective.

1982. HARE, R. C. **Detecting dead cambium with a moisture meter.** *J. For.* 58 (10), 1960 (815–7).

Describes a method of detecting in standing trees, with a modified timber moisture meter, the decrease in electrical conductivity that occurs when the cambium is killed by fire. In tests on 45 trees of 30 species, spots of cambium killed by heating the bark to 150° F. in all cases gave lower readings than adjacent unheated spots. The electrode pins of the meter examine the cambium directly without damaging the tree.

435. Benefits of Fire Control. Injurious Effects of Fire

See Nos. 1330–1.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 1330–1, 1567, 1591–2, 1696.

1983. SILKER, T. H. **The ecological approach and use of prescribed burning in Southern Pine silviculture.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (661–84). 24 refs. O.R.E.

[Cf. *F.A.* 18 No. 3893.] Mainly a discussion of revisions to *Bull. Tex. For. Serv.* No. 46.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 1579, 1754, 1836–7, 1892, 1947–8.

1984. **Weed control handbook.** Blackwell Scientific Publications, Oxford. (2nd ed.) 1960. pp. vii + 264. Price 17*s*. 6*d*.

[Cf. *F.A.* 20 No. 3305.] In this second edition the handbook is brought up to date. The information is set out in much the same order as in the first edition but chapter titles and section heads have been revised.

1985. BURSCHEL, P., and RÖHRIG, E. Unkrautbekämpfung in der Forstwirtschaft. **[Weed control in forestry.]** Verlag Paul Parey, Hamburg and Berlin. 1960. pp. 92. 125 refs. [G.] Price [18*s*.].

A practical guide, including a description, with illustrations, of the chief needs of forest and nursery; also notes on control, and on the chief herbicides, their active ingredients, mode of action and application, effects on soil, plants and animals, general techniques of application, etc. and listing German common names and some proprietary ones.

1986. THISE, L. Du débroussaillement et dégagement par produits chimiques et par engins mécaniques. **[Weed control and cleaning by chemical substances and by mechanical means.]** *Bull. Soc. For. Belg.* 67 (8/9), 1960 (304–7). [F.]

Discusses the advantages of mechanical methods (motor mowers, brush-cutters, motor cultivators) over chemical control, from the point of view of economy and convenience, as well as ecologically. Some figures are given for depreciation, labour costs and costs of fuel for the three types of machine.

1987. SEYMOUR, W. **Spraying with Dowpon.** *Quart. J. For.* 54 (4), 1960 (367–8).

Very successful results have been obtained by spraying in young plantations with Dowpon (74% dalapon) at a rate of 10 lb. to 50 gal. water per acre, for the control of grass. Spraying is best done in April before trees come into leaf. Experiments have been made with European and Japanese Larch, Corsican Pine, Beech, Red Oak and Cherry. Care must be taken to spray the ground and not the foliage. Costs are ca. £8/acre vs. £20 for hand weeding.

1988. WOOD, R. F., and HOLMES, G. D. **Silvicultural investigations in the forest: (A) South and Central England and Wales. Control of woody growth.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (38–41).

Applications of 2,4-D and 2,4,5-T on a practical scale, for the control of woody and herbaceous growth in preparing land for planting, have been carried out in 5 Conservancies. Foliage spraying or treatment of freshly cut stumps has proved effective, but basal bark spraying has been disappointing. In stump treatment, the edges and bark are the most vulnerable parts, and it is found to be a waste of material to spray the whole of the cut surface. Control of heather, before planting, with 2,4-D ester at 5 lb. (acid equivalent) in 50 gal. water/acre has been highly effective, but if done after planting, the tree crop may suffer injury unless sprays are carefully directed. The response of trees to fertilizers is greatly enhanced after the heather is killed. Dwarf gorse was effectively controlled with 2,4,5-T ester at 3–4 lb. (a.e.) in 50 gal. water/acre as an over-all spray in May–July. For Rhododendron control, the only effective treatment is by application of Ammate to the cut stumps.

1989. ŠUTOV, I. V. Primenenie arboricidov pri uhode za lesom. **[The use of arboricides in forest tending.]** In *Voprosy lesovedenija i lesovodstva.* Moscow. 1960. pp. 274–87. [Russ.E.]

Lists 60 species (mainly broadleaved) according to their sensitivity to 2,4-D, and discusses the mode of action of 2,4-D and 2,4,5-T, particularly their use against Aspen, Birch and Alder to prevent succession by these species in clear fellings in (mainly) Spruce forests.

1990. DARROW, R. A., and MCCULLY, W. G. **Brush control and range improvement in the Post Oak-Blackjack Oak area of Texas.** *Bull. Tex. Agric. Exp. Sta.* No. 942, 1959. pp. 15. 13 refs.

Recommendations for various conditions include mechanical treatments (girdling, mowing, bulldozing etc.), chemical treatments for individual plants or by broadcast or aerial application (chiefly 2,4,5-T or Silvex [2,4,5-TP-type] esters, monuron and fenuron—the latter particularly in pellet form), prescribed burning, and browsing by goats to prevent re-sprouting. [Cf. *F.A.* 21 No. 3317.]

1991. BRINKMAN, K. A. **Controlling Oaks with stem-applied herbicides.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (613–22). 4 refs. O.R.E.

A study comparing the effectiveness of 8 chemical/mechanical treatments for killing White, Black, Post and Blackjack Oaks of 5 diam. classes. It used >

14,000 numbered trees to test several concentrations of 2,4,5-T, Ammate, and monuron applied by several methods in 3 different months. Four years after treatment, a complex relationship was found between species, size of tree, month of application, and concentration of the chemicals. Of those tested, no single treatment/month combination consistently gave the best kills of all sizes and all species. Except on White Oak, a 2 lb./gal. solution of monuron applied in frills in June was more effective than any other treatment. November application of the 12·5-lb. a.h.g. (acid equivalent per 100 gal.) solution of 2,4,5-T in frills killed as many White Oaks as monuron applied in June, but February applications killed very few trees of any species. June application of the 50-lb. a.h.g. solution of 2,4,5-T killed >80% of all trees treated. Ammate killed more White and Post Oaks when used during the dormant season, but June treatments were best on Black and Blackjack Oaks. Small trees were usually easier to kill than large ones. Good crown-kills generally followed dormant-season applications, but the best kills of the root systems were obtained with June treatments. Chemical costs differed greatly among treatments; the most expensive treatment cost 15 times as much as the cheapest and was not always more effective. Even though basal sprays required only one-sixth as much time to apply as frill treatments, the chemicals used cost about 5 times as much, and this expense far exceeded that for labour; basal sprays were thus not only less effective than frills, but also cost more. The best treatment and month combination to use in a particular case depends on (1) the objectives of the landowner; (2) the species and size of trees to be treated; and (3) the cost of labour at various seasons of the year. *From author's summary.*

1992. **Eradication of undesirable coppice growth.** *Extr.* from *Rep. Wds. For. Dep. S. Aust. 1957/58*, 1959 (13).

The persistent *Eucalyptus elaeophora* has not responded to 2,4-D and 2,4,5-T so well as was hoped, but a mixture of the two as 2% and 4% solutions in oil or water effectively prevented *E. leucoxylon*, *E. rostrata* and *E. sideroxylon* stumps from coppicing and did no serious damage to *Pinus radiata* seedlings with which the area was planted.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

1993. WEERARATNA, W. G. **The ecology and biology of parasitism of the Loranthaceae of Ceylon.** *Ceylon For.* (*n.s.*) 4 (3), 1960 (264–80). 40 refs.

The distribution of the Loranthaceae is closely related to climate, and the intensity of attack is influenced by illumination. Most Loranthaceae are found to be restricted to particular species of hosts: 126 host species have been recorded. The haustorial systems of the Loranthoideae and the Viscoideae differ in their general arrangement, the former generally having external "adventitious roots", and the latter internal "cortical strands". The peripheral layer of cells of the haustorium of *Dendrophthoe falcata* is parenchymatous—no direct host/parasite xylem connexions occur. Infection causes host-cell hypertrophy, its extent being determined by both parasite and host. Tyloses and gummosis were seen in xylem vessels of *Thespesia populnea* close to the point of infection. Parasitization leads to death of the host distal to the point of infection. Loss in volume increment in timber crops, and reduction in size and quality of fruits in *Citrus* have been observed as a result of infection. *Viscum capitellatum* has been recorded as a hyperparasite on *Dendrophthoe falcata*, suggesting potentialities of biological control. All these points are amplified and discussed in the text. *From author's summary.*

1994. KUIJT, J. **The distribution of dwarf mistletoes, *Arceuthobium*, in California.** *Madroño, S. Francisco* 15 (5), 1960 (129–39). 11 refs. E.B.

1995. KIMMEY, J. W., and GRAHAM, D. P. **Dwarfmistletoes of the Intermountain and Northern Rocky Mountain Regions and suggestions for control.** *Res. Pap. Intermt. For. Range Exp. Sta.* No. 60, 1960. pp. 19. 8 refs.

The species involved are *Arceuthobium americanum*, *A. douglasii*, *A. campylopodum* var. *campylopodum*, *A. c.* var. *laricis*, and *A. vaginatum*. Their life history, means of spread, symptoms of infection and damage are described. The only satisfactory control methods known at present are eradication by felling or pruning infected trees, and silvicultural manipulation of stands in favour of non-susceptible species. Costs of these measures are discussed.

1996. REDISKE, J. H., and SHEA, K. R. **Host-parasite relationships in photosynthate translocation between dwarfmistletoe and Lodgepole Pine.** *Abstr.* in *Plant Physiol.* 35 (*Suppl.*), 1960 (iii). O.R.E.

A study was made of the host-parasite relationship of dwarf mistletoe (*Arceuthobium americanum*) growing on *Pinus contorta* var. *latifolia* seedlings, using $C^{14}O_2$. Selective administration of the $C^{14}O_2$ for 24-hour experimental periods in a controlled-environment chamber demonstrated that dwarf mistletoe carried on photosynthesis comparable to that of a cluster of Pine needles. The primary product of photosynthesis for both Pine and dwarf mistletoe, as determined by paper chromatography, appeared to be sucrose. The carbohydrates manufactured by dwarf mistletoe were translocated up and down the stem of the Pine as shown by autoradiography and analysis, whereas the carbohydrates produced by a terminal cluster of Pine needles were translocated downwards in the phloem in a direct line to the roots. The principal damaging effect of the dwarf mistletoe seems to be the inhibition of downward translocation of photosynthates to the roots. The dwarf mistletoe acts as a biological girdle resulting in an accumulation of photosynthates above the site of infection. Presumably carbohydrates can be withheld from the roots in quantities sufficient to cause the characteristic decline of the tree that is associated with severe attack.

1997. PARMETER, J. R., JR., SCHARPF, R. F., and HOOD, J. R. **Host specialization of dwarf mistletoe on Red and White Fir in California.** *Abstr.* in *Phytopathology* 50 (9), 1960 (650).

Recent surveys suggest that there are at least two distinct forms of *Arceuthobium campylopodum* specializing on *Abies*, one infesting only *A. concolor*, the other only *A. magnifica*. In most mixed stands in the northern Sierra Nevada, only one of the Fir species was infested and in many stands the healthy species appeared to be replacing it.

443. Fungi and Bacteria

See also Nos. 1455–60, 1494, 1546, 1583, 1686, 1828, 1840, 2175.

1998. HORSFALL, J. G., and DIMOND, A. E. [Editors]. **Plant pathology. An advanced treatise. Volume III. The diseased population. Epidemics and control.** Academic Press Inc., New York and London. 1960. pp. xiv + 675. Many refs. Price £7. 1*s*. 9*d*.

[Cf. *F.A.* 21 No. 4551.] Covers, in 14 chapters by different authors, the inoculum in relation to the diseased population, its potential and dispersal, epidemics, quarantines, cultural practices in disease control, soil treatment, the performance of fungicides, biological interference with epidemics, and the breeding of resistant varieties.

1999. **Bibliography of reviews, 1949–1959.** *Phytopathology* 50 (8, part 2), 1960. pp. 116.

Lists, with short annotations, reviews proper, as well as papers with exhaustive bibliographies and reviews of the position in a given field even if not documented, all arranged alphabetically in sections (e.g. Causal factors, Host-pathogen interreaction, Disease control). [There is no species index.]

2000. POLIAKOV [POLJAKOV], I. JA. **Methods of forecasting and warning on the appearance of pests and diseases in crops.** [*Proc.*] *IX International Conference on Quarantine and Plant Protection, Moscow* 1958. pp. 19. [E.] (There is also a Russian version of the paper.) I.M.I.

A short general account. [Cf. *F.A.* 21 No. 582.]

2001. DAVET, P. Relations entre les plantes de couverture et les maladies des cultures industrielles. **[Relationship between cover plants and diseases of agricultural and horticultural crops.]** *Rev. Mycol., Paris* 24 (1), 1959 (1–12). 28 refs. [F.] I.M.I.

Discusses the possibilities of infection of crops by cover plants and shade trees, presents a list of pathogens common to some well known crops and their shade and cover plants, and discusses the advantages and disadvantages of this type of culture.

2002. PEACE, T. R. **Forest pathology.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (67–70).

Enquiries at a number of nurseries have shown that attacks of *Lophodermium pinastri* on Scots Pine seedlings are almost entirely confined to nurseries in or adjacent to Pine woods. It is hoped, therefore, that the incidence of the disease in nurseries can be greatly lessened by avoiding Pine sowings in or near Pine plantations. The seedling and transplant disease caused by the fungus *Ascochyta piniperda*, which has previously been detected in Britain only on Norway Spruce, has now been found on various species of Pine.

New cases of group dying of conifers caused by *Rhizina inflata* were fewer, presumably as a result of the prohibition of the lighting of fires for brewing tea etc., during the thinning operations over large areas. Results of a fire-lighting experiment showed that burnt areas arising from fires lit at any time of year could be colonized by *Rhizina*. This is an unexpected and important finding in the control of the disease, since it can no longer be assumed that there is a safe period at the time when the fungus is not fruiting.

In an infection bed of mixed Pines and Aspens, it has been found that Scots Pine and *Pinus pinaster* become badly infected with the rust fungus *Melampsora pinitorqua*, but 8 other species tested, including Corsican and Lodgepole Pines, are so far apparently immune to the disease. The clones of *Pinus strobus*, selected in America as resistant to blister-rust (*Cronartium ribicola*) and imported some years ago, still remain healthy in the test bed, where they are subjected to intense infection, and where other clones have rapidly succumbed.

2003. GEORGESCU, C. C., and TUTUNARU, V. Beiträge zur Kenntnis der Mikromycetenflora auf Nadelhölzern in der R.U.R. **[The micromycete flora of conifers in Rumania.]** *Rev. Biol., Bucarest* 3 (1), 1958 (41–66). 11 refs. [G.] O.R.S.

Describes, with drawings, 24 species of fungus, arranged under their hosts.

2004. KRYVOŠEJ, M. S. Grybni hvoroby derevnyh ta čagarnykovih porid Ternopil′s′koji oblasti. **[Fungal diseases of tree and shrub species in Ternopol province.]** *Ukrajins′kyj Botaničnyj Žurnal, Kyjiv* [*Kiev*] 15 (4), 1958 (81–7). 13 refs. [Ukr.russ.e.] C.G.B.

In 1953–56, >150 species of fungi were identified as causing diseases in 70 tree and shrub species. Those causing serious damage included: *Microsphaera alphitoides* on Oak; *Lophodermium pinastri*, and on a lesser scale *Phoma pinastrella*, *Hendersonia acicola* and *Valsa pini*, attacking young Scots Pine; *L. macrosporum* on *Picea abies*, and *Thekopsora padi*, a rust little known in the Ukraine, on its cones, destroying 60% of the crop in one area in 1955–56; *Cylindrosporium tremulae* (causing severe dying-off) and *Septoria populi* on Poplar; *Thelephora terrestris* killing many young Pines in plantations; *Graphium* [*Ceratostomella*] *ulmi* on *Ulmus* spp.

2005. KLYUSHNIK [KLJUŠNIK], P. I. O povyšenii ustojčivosti drevesnyh nasaždenij stepnoj zony k gribnym boleznjam. **[Means of increasing the resistance to fungal diseases of tree plantations in the steppe zone.]** *Bjulleten′ Moskovskogo Obščestva Ispytatelej Prirody, Moskva* (*Otdel Biologii*) 63 (1), 1958 (65–9). [Russ.e.] From *abstr.* in *Rev. appl. Mycol.* 37 (10), 1958 (602).

Stresses the importance of the right choice of species. As *Caragana arborescens* is susceptible to *Septoria caraganae* and Ash to *Endoxylina astroidea* and other diseases, they should be planted in minimum numbers. In the last few years *Stereum hirsutum* has been widespread on Oak stumps.

2006. DAFAUCE [RUIZ], C. Las plagas de los chopos en España. **[Pests and diseases of Poplar**

in Spain.] *Bol. Serv. Plagas For., Madrid* 3 (5), 1960 (47–95). 24 refs. [Span.]

Brief descriptions of (1) fungus diseases, and (2) sap-sucking, defoliating, bud-mining, and stem-boring insects, with recommendations for control.

2007. Ito, K. **Parasitic diseases of Poplars in Japan.** Forestry Agency, Ministry of Agriculture and Forestry, Tokyo. 1959. pp. 22. 32 refs. [E.]

A brief, fully illustrated, summary and review of parasitic diseases of Poplar common in Japan, classified under the part attacked.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 1756.

2008. Volger, C. **Experiments made with fungicidal seed treatment solutions, preparations for the treatment of seedlings and soil disinfectants in conifer seed beds.** *Transl. N.Z. For. Serv.* [*n.d.*]. pp. 14 + orig. text appended. *Transl.* from *Forstwiss. Cbl.* 78 (7/8), 1959 (231–43). [See *F.A.* 21 No. 624.] Limited distribution.

2009. Jančařík, V. Padání semenáčků v lesních školkách a obrana proti němu. **[Damping-off in forest nurseries, and its control.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (181–257). 75 refs. [Cz.russ.e.]

Examination of the seedlings (both conifer and broadleaved species) in several nurseries revealed that damping off was caused mainly by *Fusarium* spp., but representatives of at least 29 other genera of fungi were also found. Three mortality phases are distinguished: pre-emergence; before the seedlings become woody; after they become woody. Application of formalin, at 60 c.c. in 6–12 litres of water per sq. m., some 10–14 days before sowing, was a good preventive measure. Applying 1% $KMnO_4$ at ca. 3 litres/sq. m., gave good control in infected beds of seedlings. The measures used in one forest nursery are analysed in detail, and the results tabulated. Cost studies showed that if $KMnO_4$ saved $\nless$5–8% (depending on species) of the seedlings, and formalin 7–10%, their use was economically justified.

2010. Kailidis, D. S., and Strong, F. C. **Damping-off of Black Pine, *Pinus nigra*, Arn.** *Quart. Bull. Mich. Agric. Exp. Sta.* 43 (1), 1960 (14–32). 21 refs.

The causal agents of damping-off of *P. nigra* in Michigan forest nursery soils proved to be, in order of their prevalence, (*a*) *Fusarium oxysporum*, (*b*) *F. solani*, (*c*) *F. moniliforme*, (*d*) *Rhizoctonia solani*, (*e*) *Pythium irregulare*, (*f*) *P. ultimum* and (*g*) *P. debaryanum*. The most pathogenic species was (*d*) followed by (*b*), (*e*), (*c*), (*a*), (*f*) and (*g*), in that order. In culture studies, *Pythium* spp. generally grew fastest at pH 5·5 and temperatures of 20–30° C.; (*d*) also grew fastest at 20–30°, but at the lowest temperatures tested (12°) was slower than *Pythium* spp. It grew well at pH 4·5, 5·5 and 6·5, and satisfactorily at pH 8·0. *Fusarium* was adapted to a wider range of environmental conditions than the other genera, growing more slowly, but with smaller differences amongst the species and strains tested in various environments. When the pathogenic fungi were grown together by pairs on potato dextrose agar, antibiosis was noted in some cases: (*b*) strain 3 exhibited antibiosis with (*a*) and (*c*) as well as with (*d*); (*d*) strain 1 was antagonistic to (*f*) and partially so to (*e*). The three *Pythium* species showed no antibiotic effects *inter se*. Studies on *P. nigra* seed germination on filter paper in Petri dishes showed that moisture is necessary for initiation of germination. After a few days, aeration became the critical factor, and total germination was best at the lowest moisture content provided. With temperature constant, germination showed two optima, at 24 and 31° C. Alternating temperatures resulted in the same germination if one temperature of the combination was favourable or optimum. If neither of the alternating temperatures was favourable, however, germination was above that at either temperature when constant. At pH 4·5 total germination % was about twice that at pH 8·5, and was reached in much less time. This is correlated with the occurrence of damping-off, since rapidly germinating seed and fast growing seedlings reach their resistant stage sooner. *P. nigra* seedlings reach this stage 25–27 days after emergence. At pH 4·5, the pre-emergence and total damping-off were less than at pH 7·0 and pH 8·5 in soil infected with pure cultures of *Fusarium* spp. and *R. solani*. Soil type and ferility also influence occurrence of damping-off of *P. nigra* seedlings. Losses were less in a soil of medium fertility than in either sand or 'muck' soil.

2011. Rowan, S. J. **Susceptibility of twenty-three tree species to black root rot.** *Abstr.* in *Phytopathology* 50 (9), 1960 (653).

In tests with seedlings pot-grown in soil heavily infected with *Sclerotium bataticola* and *Fusarium* spp. at soil temperatures of 85–90° F., 6 coniferous species died of rot and/or soil temperature, and 11 *Pinus* species were rated susceptible. Of the rest, *P. glabra* and *Juniperus virginiana* were highly, and *Cupressus arizonica*, *Taxodium distichum*, *Chamaecyparis thyoides* and *Liquidambar styraciflua* totally resistant.

2012. Hodges, C. S., and Green, H. J. **Survival in the plantation of Eastern Red Cedar seedlings infected with *Phomopsis juniperovora* in the nursery.** *Phytopathology* 50 (9), 1960 (639).

Survival rates of *Juniperus virginiana* seedlings that had 0, 1–10, 11–50 and >50% of their tops killed by the blight when planted out, were 84, 23, 6 and 3% respectively after two years. In another trial, survival ranged from 81 to 15% after one year. Most of the originally infected, but few of the originally healthy, seedlings had new infections at the beginning of the second growing season. Viable conidia of *P. juniperovora* were found on material dead as long as 18 months.

2013. Kelman, A., Gooding, C. V., Jr., and Slocum, G. K. ***Cylindrocladium* root rot of Yellow Poplar (*Liriodendron tulipifera* L.).** *Abstr.* in *J. Elisha Mitchell Sci. Soc.* 75 (2), 1959 (66–7). L.S.

Cultures of *C. scoparium* were obtained in isolations from diseased roots of *L. tulipifera* seedlings in a nursery in N. Carolina. Greenhouse inoculations were made with isolates of *C. scoparium* from *L. tulipifera* and also isolates obtained from *Pinus strobus* in N. Carolina and Delaware, and from Azalea in Alabama. Rapid death of 8-weeks-old *L. tulipifera* seedlings followed root inoculations. In inoculated 2-year-old seedlings, girdling lesions developed basally, followed by gradual wilting and death over a period of 6–8 weeks. Isolates from all three species were also pathogenic to *P. strobus* and *Abies fraseri* in greenhouse inoculations. In field studies, roots of 1-year-old *L. tulipifera* were dipped in mycelial suspensions of *C. scoparium* before planting. After one year only 43% of inoculated seedlings had survived, compared with 84% in control plots. All inoculated surviving plants showed evidence of root infection. *L. tulipifera* seedlings with root lesions from a nursery where *C. scoparium* had caused heavy damage to *P. strobus* gave only 51% survival after one year. Isolations provided typical cultures of the pathogen. It is suggested that failures of plantings of *L. tulipifera* in N. Carolina may be due in part to seedling root infection by *C. scoparium*.

2014. ITO, K., SHIBUKAWA, K., and KOBAYASHI, T. **[Blight of *Sequoia gigantea* seedlings caused by *Cercospora cryptomeriae* Shirai.]** *J. Jap. For. Soc.* 40 (9), 1958 (407–10). 8 refs. [Jap.]

Reports 3 cases of blight on young seedlings of *Sequoia gigantea* (in Honshu) which investigation showed in each case to be caused by this fungus, which is described and illustrated.

2015. SATO, K., OTA, N., and SHOJI, T. **The prevention and control of snow mould in seedlings of Sugi during transient planting [i.e. snow mould control on *Cryptomeria japonica* transplants.]** *Transl. For. Prod. Lab. Can.* No. 50934, [*n.d.*]. pp. 24. Transl. from *J. Jap. For. Soc.* 39 (10), 1957 (406–9). [See *F.A.* 19 No. 3145.] Limited distribution.

2016. SATO, K., OTA, N., and SHOJI, T. **[Investigation of *Rosellinia herpotrichioides* Hepting et Davidson as the cause of the snow blight on Yezo Spruce seedlings. (I).]** *J. Jap. For. Soc.* 41 (2), 1959 (64–71). [Jap.jap.e.*e.*]

In 11 years' work on isolation of causal fungi from various coniferous seedlings affected by snow mould [cf. *F.A.* 21 No. 1896], the authors have never once found *R. herpotrichioides*, although this was identified as the pathogen of *Picea jezoensis* in 1939 and 1940. Instead they have determined a *Rhizoctonia* sp. as the major pathogen of both *P. jezoensis* and *Abies sachalinensis*. In a detailed comparative study of the two fungi, with illustrations, marked differences are reported in the colour and fructification of mycelial mats, and in hyphal and ascospore development on different artificial media. Fungi isolated from a wide variety of Japanese conifer species affected by snow blight are also listed (in English).

2017. SATO, K., OTA, N., and SHOJI, T. **[Investigation of *Rosellinia herpotrichioides* Hepting et Davidson as the cause of the snow blight on Yezo Spruce seedlings. (II).]** *J. Jap. For. Soc.* 41 (5), 1959 (167–74). 17 refs. [Jap.jap.e.*e.*]

Further marked differences are reported between *R. herpotrichioides* (1) and the *Rhizoctonia* sp. (2) [see preceding abstract] in mycelial growth at different temperatures and pH's. In inoculation trials under snow, (2) blighted various species of Japanese conifers while (1) did not. It is concluded that (1) is not a cause of snow blight.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also No. 1840.

2018. STILLWELL, M. A. **Decay associated with wood-wasps in Balsam Fir weakened by insect attacks.** *For. Sci.* 6 (3), 1960 (225–31). 4 refs.

[Cf. *F.A.* 16 No. 4313.] Fir killed by Spruce budworm showed average sapwood penetration by fungi of 0·4 in. within one year vs. negligible deterioration in windthrows, 2 years old. Of 274 cultures made from 30 attacked trees, 80 were *Stereum chailletii*, 9 *S. sanguinolentum* and 4 *Corticium galactinum*, apparently introduced by siricids. The first fungus was also associated, in trees severely weakened by *Adelges piceae*, with the oviposition punctures of siricids, the importance of which as vectors is discussed.

2019. GREMMEN, J. Biologie en bestrijding van de wortelzwam *Fomes annosus* (Fr.) Cooke. **[Biology and control of *F. annosus*.]** *Ned. Bosb. Tijdschr.* 32 (11), 1960 (394–409). 20 refs. [Du.e.] (*Korte Meded. Bosbouwproefsta., Wageningen* No. 44.)

2020. WALLIS, G. **Relation of *Fomes annosus* incidence to soil and forest management in East Anglian Pine plantations.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (113).

In a survey of *F. annosus* attacks in first-rotation Scots Pine plantations, it was found that soil pH was of critical importance in determining the damage caused by the fungus. The critical value in the main rooting zone of the trees was pH 6; higher values resulted in greater damage.

2021. OKSBJERG, E. Nogle iagttagelser over rodfordærverangrep på sitkagran i en midt- og vestjydsk plantage. **[Some observations regarding *Fomes annosus* attacks on Sitka Spruce in plantations in central and western Jutland.]** *Dansk Skovforen. Tidsskr.* 45 (9), 1960 (345–72). 5 refs. [Dan.dan.e.*e.*]

In pure and mixed plantations aged ca. 40–50 years, on poor, gravelly, moraine soils, where mortality was high, some of the dead or diseased Sitka Spruce (excluding sufferers from *Dendroctonus micans*) had no rot or discoloration at stump level, and not one showed stem rot. All, however, showed growth reductions for 3–6 years before felling. Some Sitka and many Norway Spruce continued to grow vigorously despite advanced stem rot. In spite of lack of correlation, the author inclines to the view that rot and disease may have a common cause, the fungus attacking different tissues differently, particularly as, in another stand, trees that had died rapidly in an expanding gap strongly suggestive of parasitic infection, also in some cases lacked rot symptoms. In both plantations, moreover, *F. annosus* was found in the roots of trees both with and without rot symptoms, and in some at stump height as well, conidia being most frequent in the phloem. Dry patches found on some stump surfaces are also thought to point to a partial inactivation of the root system by fungus attack. [Cf. *F.A.* 17 No. 4093; 20 No. 814.] *From author's summary.*

2022. NEGRUCKIJ, S. F. Kornevaja gubka na možževel′nike. [***Fomes annosus* on *Juniperus sabina*.**] *Lesn. Hoz.* 12 (4), 1960 (80). [Russ.]

Discusses inoculation experiments which showed that in a year the fungus spreads 8–10 cm. round, and 10–12 cm. along the stem from the point of infection. The Juniper begins to die in 1–3 years from the time of attack, i.e. much more quickly than Scots Pine and other conifers. External symptoms of successive stages of the disease are described, and silvicultural and chemical control methods briefly outlined.

2023. MINKEVIČ, I. I. Lesopatologi v pomošč′ taksatoram. [**Forest pathology as an aid in forest inventory.**] *Lesn. Hoz.* 12 (3), 1960 (40–2). [Russ.]

On the basis of findings from Larch attacked by *Fomes officinalis* in Yakutia, discusses the possibility of determining the presence of heart rot from external indications such as scorch marks from fires, resin flow, crown dying, forking, etc. The incidence of such indicators in the age classes V–IX and over is tabulated. Of trees with heart rot, 80% showed signs of fire damage; 54%, resin flow; 94%, various degrees of crown death; and 70%, death of the tip of the crown.

2024. GOOD, H. M. **Fungi associated with *Fomes igniarius* in decay of Poplar.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (136). O.B.D.

To determine the numbers and possible significance of fungi associated with *F. igniarius* in decay of Poplar, a considerable group of isolations was made from 25 Poplar trees that showed decay typical of *F. igniarius*. From 115 to 950 isolations were made from each pocket of decay. A total of 66 fungi was isolated. Neither the type of agar used nor storage at −180° C. for periods up to 10 months appreciably affected the range of fungi obtained. A number of fungi (5–27) occurred in each pocket of decay. None appeared to be sharply limited to a particular stage of decay or region of the tree. Of the 10 smallest pockets studied, only one yielded *F. igniarius*, though the specificity of the symptoms and the failure to isolate other known decay organisms left little doubt that *F. igniarius* had caused the decay and had died out, presumably as a result of competition. Parallel studies of wounds and branch stubs of Poplar suggest that a number of fungi may precede *F. igniarius* in colonizing the stem. No studies of synergistic or antagonistic effects among the fungi have yet been made.

2025. THOMAS, G. P., ETHERIDGE, D. E., and PAUL, G. **Fungi and decay in Aspen and Balsam Poplar in the Boreal Forest Region, Alberta.** *Repr.* from *Canad. J. Bot.* 38 (4), 1960 (459–66). 7 refs.

Examination of 835 (*a*) *Populus tremuloides* and 527 (*b*) *P. balsamifera* trees on 47 sample plots in mixed forest in central and north Alberta showed 73% of (*a*) and 61% of (*b*) to be decayed. Additional trees of both species were infected by stain fungi. The incidence of infection in (*a*) decreased from mesic to dry sites, but for (*b*) remained about the same. *Fomes igniarius* caused the greatest volume of decay in both species. *Corticium polygonium* and *Radulum casearium* together caused about as much decay in (*a*) as *F. igniarius*, though neither occurred in (*b*). Incidence of *Pholiota destruens* was low in (*b*), but it caused most decay after *F. igniarius*; it did not occur in (*a*). Many fungi caused both basal and stem infections in both hosts, but few caused infections of one type only. *Armillaria mellea* had highest incidence in butts of (*a*), but was exceeded by *P. spectabilis* in (*b*). Most butt decay was caused by *Phlebia strigosozonata* in (*a*) and by *P. spectabilis* in (*b*). The total loss of volume due to decay was 25% for (*a*) and 10% for (*b*). *From authors' summary.*

2026. GARRETT, S. D. **Rhizomorph behaviour in *Armillaria mellea* (Fr.) Quél. III Saprophytic colonization of woody substrates in soil.** *Ann. Bot., Lond.* 24 (94), 1960 (275–85). 9 refs. O.R.E.

[Cf. *F.A.* 18 No. 1792.] Rhizomorphs put out by *A. mellea* from small woody inocula in tubes of moist soil were tested for their ability to colonize segments of Willow shoots (previously killed and then buried for various periods in the soil before inoculation). A period of previous burial in soil of ⩽3 weeks did not diminish availability of the substrate segments to *A. mellea*, but with longer periods substrate value for *A. mellea* progressively declined. Segments of living, green Willow shoots proved a consistently better substrate than dead segments, and maintained their substrate value over periods of ⩽7 weeks of previous burial in soil. In the infection of living tissues, *A. mellea* benefits from the exclusion of competition by host resistance; in the saprophytic colonization of dead tissues, *A. mellea* has the advantage of its capacity to decompose cellulose and lignin, which are substrates restricted to a minority of soil fungi. *From author's summary.*

2027. CHEVAUGEON, J. Le problème des pourridiés en Côte d'Ivoire. [**The rot problem in the Ivory Coast.**] *Rev. Mycol., Paris* 24 (1), 1959 (39–58 + 1 plate). 19 refs. [F.] I.M.I.

Discusses symptoms of attack by *Leptoporus* [*Fomes*] *lignosus*, reviews its importance as a pathogen in forest and plantation crops in the lower Ivory Coast (giving a list of susceptible species), and summarizes briefly methods of prevention and control, with particular reference to plantation crops.

2028. BANERJEE, S., and SARKAR, A. **Studies on heterothallism. IV. *Ganoderma lucidum* (Leyss) Karst.** *Sci. & Cult.* 24 (4), 1958 (193–5). 7 refs. E.M.B.

Tabulates the results of pairing monospore cultures from sporophytes on *Swietenia mahagoni* to show 4 mating types in this heterothallic species.

2029. DADANT, R. Pourriture de l'écorce des *Albizzia stipulata* à Madagascar. [**A bark necrosis of *A. stipulata* in Madagascar.**] *Bulletin, Institut de Recherches Agronomiques de Madagascar, Tananarive* No. 3, 1959 (84–5). 1 ref. [F.] E.M.B.

The disease described attacks shade trees of this species of all ages on heavy damp sites, particularly after prolonged spring flooding. Its pathogen has been identified as a *Phytophthora* sp. The necroses frequently start at or below ground level and grow to lengths of ca. 1 m. The bark is discoloured, moist, and cracked, and exudes resin. When the necrosis completely encircles a tree, it kills it. Death is often rapid, but sometimes the progress of the disease is arrested by callus formation. It is suggested that *A. stipulata* should be replaced on wet sites by *Inga dulcis* as a shade tree for coffee, the latter species being considered resistant to flooding and fungus attack.

2030. DILLER, J. D., and KOCH, E. J. **Spread of "house-decay" fungus through soil to a standing Virginia Pine tree.** *Abstr.* in *Phytopathology* 50 (8, part 1), 1960 (571).

Poria incrassata was found in the basal 6 ft. of a 40 ft. high, wind-broken *Pinus virginiana* on a site where several trees had died, following experiments in which the fungus was grown on the ground under mounds of leaves [cf. *F.A.* 16 No. 1126; 21 No. 2468].

2031. CHILDS, T. W. **Laminated root rot of Douglas-Fir.** *For. Pest Leafl. U.S. For. Serv.* No. 48, 1960. pp. 6. 5 refs.

Describes the disease caused by *Poria weirii*, its symptoms, spread, damage (mortality rather than degrade through heart rot) and control (only indirect control by management practices).

2032. SCHÖPFER, W. Zur Frage der Wertschädigung durch Immenrosigkeit. [**Loss of value [in Pine] through heart rot.**] *Allg. Forstzeitschr.* 15 (44), 1960 (631–4). 2 refs. [G.g.]

A study in N. Baden showed that of 106 Scots Pine aged 131–155 years from 4 loess-loam sites, 58% had heart rot, which in nearly ⅓ of the stems necessitated cutting off large parts of the butt log (mean length lost 1·5 m.), and caused a depreciation of ca. 4% (DM. 8/cu. m.) equivalent to 3–4 times the value of the c.a.i. The rot, attributed to *Sparassis ramosa*, was particularly frequent in trees from ridges, dry slopes, or sites with a compacted layer. Trees with strong heartwood formation appeared to be more susceptible. As trees <100 years were generally sound, shorter rotations are advocated.

2033. DAVIDSON, R. W., LENTZ, P. L., and MCKAY, H. H. **The "pecky" decay of Bald Cypress and a *Stereum* associated with it.** *Abstr.* in *Phytopathology* 50 (8, part 1), 1960 (570).

A *Stereum* species isolated from decayed *Taxodium distichum* wood, found to be identical with one growing on dead branch stubs of an infected tree, is described. It is distinguished from *S. sulcatum*, also found on Cypress, by a basidiocarp with a greyish rather than a salmon hymenium, prominent, thick hyphae in place of slender, inconspicuous ones, and various culture characteristics.

Wilts, Diebacks etc.

See also No. 2047.

2034. PEACE, T. R. **The status and development of Elm disease in Britain.** *Bull. For. Comm., Lond.* No. 33, 1960. pp. 44 + 76 photos. 93 refs.

A bulletin devoted mainly to describing the surveys in Britain of Elm disease caused by the fungus *Ceratostomella ulmi*. These were started in 1928, and continued with some interruptions until 1955. To provide the necessary background a brief description of the disease is given, followed by a consideration of its history and distribution with particular reference to Britain. Brief descriptions are given of other diseases of Elm, which might be confused with that caused by *C. ulmi*. Variability in the fungus and differences in resistance in the host are described, with particular reference to their influence on the general course of the disease. The progress of the disease as disclosed by the surveys is considered in relation to (*a*) the individual tree, where the phenomenon of recovery is particularly discussed, (*b*) local populations, and (*c*) the country as a whole. A final section is devoted to methods of control. It is concluded that the disease has declined erratically, but continuously, since 1936–37, not only in the number of Elms affected, but also more particularly in the severity of the damage caused. It is believed that this reduction has also occurred on the Continent. The reasons for the decline are not properly understood, and there is evidence against its being due either to loss of virulence by the fungus or to the higher resistance of the surviving Elms. It may be connected with the wartime clearance of diseased Elms for timber and firewood and the favourable post-war market, which still makes the felling of dying Elms an economic proposition. Control should be limited to the removal of Elms that are dead, nearly dead or unsightly, since these may act as centres of spread for infected beetles. Where possible, dead limbs, which serve the same role, should also be removed. Unbarked logs and Elm firewood should never be left in the vicinity of living Elms. These precautions should lessen the possibility of severe local outbreaks. *From author's summary.*

2035. BOYCE, J. S., JR. **Distribution of *Ceratocystis fagacearum* in roots of wilt-infected Oaks in North Carolina.** *Phytopathology* 50 (10), 1960 (775–6). 3 refs.

Out of a total of 329 lateral roots of 42 wilting Oaks situated within 30 ft. of wilt-killed trees, 46 roots of 23 trees (*Quercus coccinea*, *Q. falcata*, *Q. rubra* and *Q. velutina*) at 17 infection centres, showed infection near the stem, 21 at 9 ft., and 1 even at 24 ft. distance. In some, infection was continuous, in others, intermittent. Only 3 inter-tree root grafts were found, and only in one was the fungus isolated from both sides of the graft. In the second it was not found near the graft, neither in the root of the wilting tree nor in that of a wilt-killed stump; and in the third, an infected root was grafted to a healthy root of an apparently healthy tree. Roots were often close together or in contact, but so far no growth of the fungus in the soil or soil vectors have been found to account for infection under such circumstances.

2036. Buchanan, W. D. **Insects associated with wounds on trees that develop Oak wilt.** *J. econ. Ent.* 53 (4), 1960 (578–81). 6 refs.

In the 4-year period 1955–58 inclusive, it was found in five study plots in S.E. Missouri, that the incidence of Oak wilt in Black and Scarlet Oaks was significantly higher in trees that were blazed with an axe or wounded by boring auger holes in their stems, than it was in similar trees that were given a puncture type of wound or were not wounded. However, no infections developed in trees that were wounded before April 11 or after May 6. In all cases Oak wilt developed in the same season that the tree was wounded. It seems likely that such insects as sap-beetles, wood roaches, and carpenter ants, carried the inoculum to the trees that developed Oak wilt. This is concluded because one or more of these insects was caught in traps that were stapled in auger holes on trees that developed Oak wilt. However, the source of the inoculum is unknown, because no Oak wilt fungus mats or other recognized sources of the fungus were found in systematic surveys made within and around the five plots. *From author's abstract.*

2037. Houston, D. R., and Kuntz, J. E. **The effects of temperature and moisture on Oak wilt development.** *Abstr.* in *Phytopathology* 50 (9), 1960 (640).

When soil and air temperatures were kept constant, the wilt % of inoculated Chinese Oak [*Quercus variabilis*?] seedlings was nil for 20 days at 16°, 32° and 36° C., reached 50% in ca. 16 days at 20°, and 100% in 9·5 days at 28°. Where soil and air temperatures differed, the latter had the greater effect. Symptoms developed during or after a decline in transpiration. *In vitro*, the fungus grew best at 24°, little at 16° and 32°, and not at all at 36°. In full sunlight, a temperature of ≥32° readily developed in logs and occasionally in standing trees of Northern Pin Oak [*Q. ellipsoidalis*] and sometimes in logs, but never in standing trees, of Bur Oak [*Q. macrocarpa*]. Only 1 out of 9 young Red Oaks developed symptoms when moisture was practically excluded, for 2 weeks before and 1 week after inoculation, by a 4-ft. trench and a plastic tent, whereas 11 out of 12 did so on an adjacent well watered area.

2038. Roncadori, R. W., and True, R. P. **The nutritional competition between *Hypoxylon punctulatum* and *Ceratocystis fagacearum*.** *Abstr.* in *Phytopathology* 50 (8, part 1), 1960 (573).

When *H. punctulatum*, a fungus often causing rapid decay of sapwood in deep-girdled Oak-wilt trees [cf. *F.A.* 21 Nos. 640, 2004] was inoculated into fresh wounds, its incidence and distribution increased, but the frequency of isolation of *C. fagacearum* was not reduced after 10–12 weeks. *C. fagacearum* did, however, grow poorly on a medium of bark or sapwood decayed by *H. punctulatum*, unless N was added, the N still present in the decayed sapwood not apparently being available to it. It is concluded that rapid growth of *H. punctulatum* decay creates unfavourable nutritional conditions for growth and sporulation of *C. fagacearum*.

2039. Craighead, F. C., and Nelson, J. C. **Oak wilt in Pennsylvania.** *J. For.* 58 (11), 1960 (872–81). 32 refs.

Discusses the results of survey, control and transmission studies of Oak wilt in the period 1952–58 at the Blain Oak Wilt Laboratory, Perry County, Pa. A table is given of animals frequenting both mats and wounds on diseased trees, and bleeding wounds on healthy trees.

2040. Kessler, K. J., and True, R. P. **Symptoms of *Verticillium* wilt in Yellow poplar [*Liriodendron tulipifera*].** *Abstr.* in *Phytopathology* 50 (8, part 1), 1960 (572).

A study of a single tree, which had developed wilting symptoms associated with *Verticillium dahliae*, leading to discoloration, defoliation and the death of many branches in one year, and the production of dwarf leaves and dwarf flowers in the next. Extensive purple vascular discoloration was found in the roots, stem, and larger branches, but not in small twigs. The fungus was often, but inconsistently, isolated from the discolored wood.

2041. Bloomberg, W. J., and Funk, A. **Willow blight in British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (5), 1960 (3–4).

Crown mortality in a group of ornamental Willows at the University of British Columbia Arboretum has been identified as blight caused by *Fusicladium saliciperdum*.

Cankers, Stem Rusts etc.

See also Nos. 1438, 2002, 2054.

2042. Hawksworth, F. G., and Hinds, T. E. ***Cytospora* canker of Engelmann Spruce in Colorado.** *Repr.* from *Plant Dis. Reptr.* 44 (1), 1960 (72). 2 refs.

C. kunzei was found on Engelmann Spruce for the first time in Colorado in 1959. The affected trees had been severely damaged by a hail storm in 1955.

2043. Peterson, R. S. **The *Cronartium coleosporioides* complex in the Black Hills.** *Repr.* from *Plant Dis. Reptr.* 43 (12), 1959 (1227–8). 10 refs.

Reports for the first time the occurrence of the *C. coleosporioides* complex on Ponderosa Pine in the Black Hills (S. Dakota) and in eastern Wyoming. New hosts for the telial stage are reported in the Scrophulariaceae.

2044. Arsdel, E. P. van, and Riker, A. J. **Blister rust inoculations on White Pines.** *Abstr.* in *Phytopathology* 50 (9), 1960 (657).

In tests in which *Pinus strobus* were inoculated with *Cronartium ribicola* in a fog chamber at 16° C. by wrapping telia-bearing *Ribes* leaves round localized parts, trees generally remained free from rust after 4 years if the period in fog had been ≤48 hours. For periods of 52 to 72 hours, the % of cankered trees increased up to 92. In two tests with 72 and 90 hours of fog, interrupted after 36 hours by a 10-hour period of warm and dry conditions, the % cankered was $<\frac{1}{4}$ of that for trees uninterruptedly exposed. Inoculations were often successful on young shoots, whether or not needles were present, and less often on 1-year-old needles.

2045. Moss, V. D., Viche, H. J., and Klomparens, W. **Antibiotic treatment of Western White Pine infected with blister rust.** *J. For.* 58 (9), 1960 (691–5). 16 refs.

Reviews progress to date in treating *Pinus monticola* in the northern Rocky Mountains with Actidione BR (4% cycloheximide), describes basal application procedure, lists suitable types of back-pack sprayer, and discusses the present blister-rust control programme. [Cf. *F.A.* 20 No. 737.]

2046. Oganova, Ė. A. Ėndoksilinovyj ("ložnyj") rak jasenja obyknovennogo i ego vozbuditel′. [***Endoxylina*** **("false") canker of *Fraxinus excelsior*, and its pathogen.**] *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (151–63). 15 refs. [Russ.]

Describes the canker caused by *E. stellulata* [cf. *F.A.* 20 No. 3340], and its conidial stage, and makes recommendations for control.

2047. Vlasov, A. A., Krangauz, R. A., and Ljajman, E. Ė. Parazitizm vozbuditelej negnilevyh zabolevanij stvolov duba, jasenja i topolja. [**Parasitism of pathogens causing stem necroses and cankers in Oak, Ash and Poplar.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (185–205). [Russ.]

Observations and inoculation trials in S.E. European Russia showed that necroses and canker were caused on *Quercus robur* by *Cytospora quercina*, *Naemospora croceola*, *Coryneum umbonatum*, *Fusicoccum quercus*, *Clithris quercina*, *Phomopsis pseudoacaciae*, *Verticillium albo-atrum*; on *Fraxinus excelsior* by *Cytophoma pulchella*, *Endoxylina astroidea*, *Cytospora* sp., *Phoma* sp.; and on *Populus* × "*canadensis*" by *Cytospora foetida*.

2048. Wood, F. A., and French, D. W. **Bacteria in the perithecia of *Hypoxylon pruinatum* and their effect on ascospore germination and development.** *Abstr.* in *Phytopathology* 50 (9), 1960 (659).

Bacteria were present in 60% of the stromata from 40 *Populus tremuloides* suffering from *Hypoxylon* cankers, and greatly reduced germination of ascospores and culture growth *in vitro*. Streptomycin in the medium increased germination and growth. The bacteria may influence the establishment of the fungus in nature.

2049. Torres Juan, J. Nueva enfermedad del chopo en España. [**A Poplar disease new to Spain.**] *Bol. Serv. Plagas For., Madrid* 3 (5), 1960 (11–4). [Span.]

Dothichiza populea, hitherto reported only once in Spain (in Lérida, 1924) has now been discovered causing serious damage to Poplar in Guadalajara, where it appears to have enjoyed optimum climatic conditions during the 1959–60 winter. Short notes on the disease and its control are given.

2050. Schönhar, S. Untersuchungen über die Anfälligkeit verschiedener Pappelsorten gegen *Dothichiza populea*. [**The susceptibility of various Poplar varieties to *D. populea*.**] *Allg. Forst- u. Jagdztg.* 131 (11), 1960 (259–61). 7 refs. [G.g.e.]

In a further series of tests [cf. *F.A.* 19 No. 623] on 1 + 1 plants of *P.* × *canadensis* cultivars in two nurseries over two growing seasons, "serotina" was the most susceptible (about as bad as "robusta") and "Neupotz" least (about as good as "regenerata Harff"), with "Leipzig", "Forndorf" and "missouriensis (Holl.)" moderately susceptible and "grandis", "gelrica" and "brabantica" less so. When inoculum was applied in bark cuts, in each variety infection rates obtained in one year were similar to those after two years when it was applied on unwounded bark [cf. *F.A.* 19 No. 1962].

2051. Tóth, I. Megfigyeléseim a nyárfarákról. [**Observations on *Dothichiza* canker of Poplars.**] *Erdö* 6 (7), 1957 (251–6). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (1), 1958 (11–2). [E.] C.G.B.

From 20 years' study and experiment, the author concludes that the vital functions of *Dothichiza populea* are suspended in warm weather and that the bark necrosis seen on nursery stock in winter results from infection in the previous spring. Infected plant material dies soon after planting out, and healthy plants infected in the plantation die within the year. The disease becomes destructive only in wet cool weather, or when insect vectors increase excessively or young Poplars become debilitated. Before field planting, thorough mechanical cultivation is advised. Until resistant varieties are available, areas liable to the disease should be planted with scions of *P.* × *marilandica* in prepared soil (rooted and top-pruned if in areas temporarily flooded). *P. nigra* hybrids for main stands should be planted only in areas suiting them, and then in mixture (e.g. with *Salix alba* or *P. alba*). The rearing of game birds is important for insect control. Plant material should be raised under effective insect control and the beds managed on a rotation with agricultural crops.

2052. Tóth, I. Újabb megfigyelések a "nyárfarákról". [**New observations on Poplar canker.**] *Erdö* 7 (11), 1958 (420–4). [Hu.russ.g.]

Reports 2 years' studies on the effect of plant handling, banding and individual resistance to the spread of [*Dothichiza populea*?] canker. Cutting back is useful; banding has no effect; the connexion between bark necrosis and frost is quite undetermined. The resistance of 38 clones is tabulated.

2053. Powell, R. W., Jr. **Yellow Poplar dieback.** From *abstr.* in *J. Elisha Mitchell Sci. Soc.* 75 (2), 1959 (67). L.S.

[Cf. *F.A.* 18 No. 4375.] Isolations from infected trees in the Duke University Forest have yielded a *Dothiorella* sp. that will produce symptoms when inoculated into healthy *Liriodendron tulipifera* seedlings. It is believed that this is the imperfect stage of *Botryosphaeria ribis*, a known pathogen on a wide variety of hosts.

Foliage Diseases

See also No. 2002.

2054. Lohwag, G. *Coleosporium* an *Pinus brutia* Ten. **[Rust on *P. brutia*.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (24–8). 3 refs. [G.Turk.]

Briefly discusses a rust caused on needles of *P. brutia* in Turkey by *Peridermium pini* f. *acicola*. The *Coleosporium* stage has not so far been identified.

2055. Uozumi, T. **[*Adelopus* on *Abies*.]** *J. Jap. For. Soc.* 41 (6), 1959 (243–5). 5 refs. [Jap.]

The author reports his discovery of *A. nudus* (fully described) on *Abies veitchii*, *A. homolepis* and *Tsuga diversifolia*, this fungus having been previously reported in Japan only on *A. mayriana*.

2056. Mizukami, T., and Saiki, U. **[New disease of *Metasequoia glyptostroboides* Hu et Cheng caused by *Pestalotia* sp.]** *Agric. Bulletin, Saga University* No. 9, 1959 (91–5). [Jap.e.] From *abstr.* in *Biol. Abstr.* 35 (19), 1960 (54228).

The causal fungus of this leaf-spot disease was identified as a *Pestalotia* sp. closely resembling *P. shiraiana*, which occurs on *Cryptomeria japonica*.

2057. Moreau, C., and Moreau, M. Champignons foliicoles de Guinée. I. Ascomycètes du *Lophira alata* Banks et leurs parasites. **[Leaf fungi of Guinea. I. Ascomycetes of *L. alata* and their parasites.]** *Rev. Mycol., Paris* 24 (4), 1959 (324–48). 22 refs. [F.] I.M.I.

Descriptions of 9 species, 5 of them new.

2058. Ito, K., Terashita, T., and Hozaka, Y. **Variation in shape of conidia of *Cercospora platanifolia* Ellis et Ev.** *J. Jap. For. Soc.* 41 (6), 1959 (229–37 + 2 plates). 14 refs. [E.e.jap.]

[Cf. *F.A.* 13 No. 1345; 15 No. 422.] A detailed study showing the two distinct conidial types of *C. platanifolia*, viz. *Cercospora* and *Stigmina*. Data are presented on the seasonally varying preponderance of one type or other in the form of necrotic or sooty lesions on *Platanus* leaves.

2059. Neely, D., and Himelick, E. B. **The early leaf and twig blight stage of Sycamore anthracnose.** *Abstr.* in *Phytopathology* 50 (9), 1960 (648).

Experiments with bud sterilization and protection from infection, combined with the mycological analysis of stem sections below infected buds, indicated that the early leaf and twig blight stage of the disease, characterized by cankers developing round the infected bud at the time of leaf expansion, is caused by mycelium of *Gnomonia veneta* overwintering inside the stem, and not by a fresh infection of the new leaves.

2060. Fresa, R. La presencia de *Sphaceloma meliae* en el "paraíso" (*Melia azedarach*). **[The presence of *S. meliae* on *M. azedarach*.]** *Revista de Investigaciones Agrícolas, Buenos Aires* 12 (4), 1958 (409–12). [Span.span.] C.G.B.

Sphaceloma meliae is reported for the first time in Argentina on leaves and branches of *M. azedarach*. The fungus is briefly described.

2061. Hashimoto, H. **[Spot anthracnose of wax trees.]** *J. Jap. For. Soc.* 41 (6), 1959 (239–42). 6 refs. [Jap.]

A disease attacking several species of *Rhus* in Kyushu, and previously reported only on *R. sylvestris*, was identified by the author as caused by *Sphaceloma rhois* or a closely similar species. The fungus is described in detail.

2062. Carter, J. C. **Wetwood disease of Elm and its control.** *Trees Mag., Ohio* 20 (6), 1960 (6–7, 22).

Practical advice on pruning, drainage of fluxing wounds, and testing apparently cured trees to make sure that no bacterium is present. [Cf. *F.A.* 17 No. 1759.]

444. Virus Diseases

2063. Einige Ergebnisse der tschechoslowakischen Pflanzenvirologie in der Jahren 1957–1959. **[Some results of Czechoslovakian work on plant viruses in 1957–59.]** *Preslia* 32 (4), 1960 (398–422 + 11 plates). [G.] E.M.B.

Summaries of papers read at a conference of Czech virologists at Litoměřice, 1959. Two of the papers are of forestry interest: Information on virus disease of conifers (*C. Blattný*); and Experiments in transmitting the Spruce virus by Aphidoidea (*A. Pintera*).

2064. Saho, H. **[On the amino acids of *Paulownia tomentosa* (Thunb.) Stend. affected by the witches' broom. (Part II.) The amino acids of roots.]** *J. Jap. For. Soc.* 41 (1), 1959 (19–21). 6 refs. [Jap.jap.e.*e*.]

As in a previous study with leaves [cf. *F.A.* 20 No. 4815] no difference was found in the amino acids in alcohol-soluble and alcohol-insoluble extracts from healthy and infected roots quantitatively analysed by paper chromatography, but the existence of an unknown ninhydrin-sensitive substance in infected roots pointed to a difference between the hyrolysates from healthy and those from infected roots. Chromatographic data and a tabulated list of the amino acids found are presented in English.

45. Damage by Animals

451. Mammals

See also No. 1558.

2065. **Noxious animals issue.** *New Zealand Science Review, Wellington* 17 (2), 1959 (18–38). L.S.

A series of papers on the effect of browsing animals on protective vegetation in New Zealand: The noxious-animal problem (*A. L. Poole*); Noxious-animal problems of the South Island alpine watersheds (*J. T. Holloway*); Animal damage in North Island protection forests (*P. J. McKelvey*); Ecology of the larger wildlife mammals of New Zealand (*R. I. Kean*); Effect of deer and other noxious animals on New Zealand soils (*I. J. Pohlen*).

2066. Mollison, B. **Progress report on the ecology and control of marsupials in the Florentine**

Valley. With discussion. *APPITA, Melbourne* 14 (2), 1960 (xxi–xxvii). 5 refs.

Browsing damage to *Eucalyptus regnans* seedlings in cut-over areas of the Florentine Valley region of S. Tasmania has necessitated investigation into control of the marsupial populations involved. Two wallabies (*Thylogale billardieri* and *Protemnodon rufogrisea*) and the brush possum (*Trichosurus vulpecula*) have been identified as the culprit species, and their distribution and abundance in the study area are discussed. The control method best suited to the area is localized poisoning of affected coupes. The results of poisoning to date suggest that the wallabies will be more difficult to control, as they tend to re-invade poisoned areas more quickly than the possum. An ecological approach is planned for future research, to determine the history of coupe invasion and reinvasion or survival after poisoning. The particular problems of difficult access to burnt coupes and the low recovery of poisoned carcases in dense undergrowth may be overcome by maintaining open bulldozer tracks when slash-felling, and by night observations of the poisoning techniques being evolved. *From author's summary.*

2067. POSTNER, M. Ungewöhnlich starke Nageschäden der Rötelmaus, *Clethrionomys glareolus* Schreb. (Muridae, Mamm.) an Jungfichten. **[Unusually severe damage by *C. glareolus* to young Spruce.]** *Anz. Schädlingsk.* 33 (9), 1960 (135–7). 22 refs. [G.]

During the 1959–60 winter numerous forest districts in Middle Franconia, Swabia and upper Bavaria reported extensive damage by *C. glareolus*. Stems of young Spruce as well as Larch, Scots Pine, Douglas Fir and White Pine, were gnawed. In the Spruce, shoots and buds were also damaged. A review is presented of European literature on damage by *C. glareolus*. Hitherto Larch has been the chief object of attack. A possible connexion with the drought of 1959 is postulated. Where attack seems to be threatened it is advisable to spray stems, particularly of Larch, with toxaphene.

2068. Hirvivahinkokomitean mietintö. **[Report of committee on damage by elk.]** *Silva fenn.* No. 106, 1960. pp. 57. [Fi.e.]

Elk damage was found to occur mainly in young stands dominated by Scots Pine, Birch, or Aspen; of these, Scots Pine stands are much the most extensive, but 86% of the young Pine stands browsed will probably recover. The question of compensation to forest owners is discussed.

2069. UECKERMANN, E. Wildstandsbewirtschaftung und Wildschadensverhütung beim Rotwild. **[The management of red deer, and the prevention of red deer damage.]** Verlag Paul Parey, Hamburg and Berlin. 1960. pp. 162 + 83 photos. 84 refs. [G.] Price £1. 3*s*. 0*d*.

Includes a section covering types of damage—barking, browsing, rubbing, and damage to field crops—and discussing causes, species preferences, extent of damage etc.; and another on prevention (admittedly never complete) by (1) regulation of game densities, (2) protection of crops by fencing, mechanical protection of individual trees, repellents etc., and (3) improving game food supplies by silvicultural measures, artificial pastures, and winter feeding, with discussions on the effectiveness, economics, etc. of each, and dealing mainly with W. German conditions, largely from German literature and the author's published or unpublished researches.

2070. LOSCHEK, H. Endlich ein 100prozentig wirksames Pflanzenverbiss-Schutzmittel. **[At last—a 100% effective protective device against browsing.]** *Allg. Forstztg.* 71 (21/22), 1960 (246). [G.]

Claims that water-repellent paper bags, perforated to let in light and air, completely protected the tops of young trees against deer without adverse growth effects. The bags are left on until after flushing. Costs per 1000 were Sch. 210 to 294 for re-usable bags in sizes from 20 × 8 to 39 × 11·5 cm., and Sch. 240/ha. (4000 plants) for putting them on by unskilled labour plus Sch. 40/ha. for taking them off.

2071. STACKELBERG, S. VON. Geräte zum Ausbringen chemischer Wildverbissschutzmittel. **[Equipment for the application of chemical deer-repellents.]** *Forstarchiv* 31 (10), 1960 (182–4). [G.]

Describes 11 kinds of German-made equipment for the brushing or spraying of repellents, with tabulated data on volume capacity, weight, price, and suitability for use with 14 proprietary repellents.

2072. PAUL, H., and GRAMMEL, R. Wildschutzzäune. **[Deer fences.]** *Allg. Forstzeitschr.* 15 (40), 1960 (577–80). 5 refs. [G.]

Discusses material, erection, and costs of fences developed as standard in S. Württemberg. These are of wire-mesh suspended by a taut wire from impregnated posts. Those against roe deer and hare generally have a hexagonal 76-mm. mesh of 1·2-mm. gauge, and are 1·2 m. high, with an expected service life of 12 years. Those against red deer have a square 70-mm. mesh of 1·8 mm. gauge and are 1·5 m. high, with a life of 18 years. Costs per metre, including labour, but excluding gates and stiles, are given as DM 1·05–1·15 and DM 1·58–1·70 respectively.

452. Birds

2073. EASTMAN, W. R., JR. **Eating of tree seeds by birds in Central Oregon.** *Res. Note (For. Lds. Res.) Ore. For. Res. Cent.* No. 42, 1960. pp. 24. 7 refs.

Observations of birds were made weekly in May–Dec. 1958 at 320 stations along a 4-mile route near Tumalo. Data are tabulated by species on: number of birds seen; intensity of activity judged by sound; crop analyses; choice of food (including Pine seed) in cages. Vegetation included various densities of *Pinus ponderosa* and *Juniperus occidentalis*, brush and grass. Birds tended to avoid areas with little vegetation. Of a total of 1617 birds seen, 1152 belonged to the 18 species found to eat Pine seed, including both residents and migrants. The bird population reached its peak during seed-fall (Sept.–Dec.). Since it was numerous enough to make serious inroads into all but the best seed-crops, and to eat more seed per acre than would be sown in artificial regeneration, the use of coloured seed and noise makers is suggested for investigation.

2074. Krysztofik, E. Wpływ żeru krzyżodzioba świerkowego na urodzaj szyszek i pozyskanie nasion modrzewia. **[The effect of crossbill feeding on the cone harvest and seed yield of Larch.]** *Las Polski* 34 (18), 1960 (4–6). [Pol.]

Gives data on cone and seed damage by *Loxia curvirostra* in various parts of Poland.

2075. Bauer, Z., and Tichý, J. Vliv sýkory uhelníčka (*Parus ater* L.) na pěstování jedle, zejména na východním Slovensku. **[Effect of *P. ater* on Silver Fir in E. Slovakia.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (5), 1960 (395–408). 23 refs. [Cz.cz.russ.e.]

The harmful effect of *P. ater* was studied in forest nurseries and also in old Fir/Beech stands. It eats Fir seed and is a threat to raising the species in nurseries in this region which are surrounded by managed Spruce stands, open mixed Beech stands of the *Fagetum pauper*, and by stands of the *Abieto-Fagetum*. In natural stands, *P. ater* is not the main, although a substantial, cause of the failure of Fir to regenerate naturally. Where *P. ater* is a threat, clear fellings should be avoided, and group-selection management with a long regeneration period established.

453. Insects

See also Nos. 1494, 1686, 1828, 2000, 2006, 2036, 2180.

2076. Anderson, R. F. **Forest and shade tree entomology.** John Wiley & Sons Inc., New York and London. 1960. pp. vii + 428. Many refs. Price £3. 8*s*.

A textbook and manual for the use of students of forestry and entomology in the U.S.A. General chapters on insect physiology, classification, ecology, control and surveys, are followed by more detailed chapters on defoliators, bark borers, wood borers, sap suckers, pests of buds, twigs and seedlings, root-feeding insects, and pests of cones and seeds.

2077. Il'inskij, A. I. Razvitie lesozaščity v našej strane. **[Development of forest protection [against insect pests] in the U.S.S.R.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (168–84). [Russ.]

A general survey of forest protection from the 19th century to the present, listing the main tasks for the future.

2078. Mathur, R. N., and Singh, B. **A list of insect pests of forest plants in India and the adjacent countries (arranged alphabetically for the use of forest officers). Part 4. List of insect pests of plant genera 'C' (concluded) (*Clausena* to *Cytisus*). Part 5. List of insect pests of plant genera 'D' to 'F' (*Dactyloctenium* to *Funtumia*). Part 6. List of insect pests of plant genera 'G' to 'K' (*Gamblea* to *Kydia*).** *Indian For. Bull.* (*n.s.*) No. 171 (3–5), 1960. pp. 45 + 165 + 91. Prices *Rs.* 5.25; *Rs.* 10; *Rs.* 7.25. [Cf. *F.A.* 21 No. 2039.]

2079. **[Forest protection and wood preservation.]** *Nar. Šumar., Sarajevo* 13 (9/10), 1959 (535–626). 68 refs. [Croat.g.]

Includes the following papers: *Lymantria dispar* as a biological problem (*Ž. Kovačević*); The occurrence of *Rhyacionia buoliana* in Pine plantations (*E. Georgijević* and *J. Batinica*); *Apethymus abdominalis*, a new pest of Oak coppice (*I. Spaić*); Pests of forest tree seed found in Bosnia and Herzegovina in 1958 (*K. Fitze*); A pest of *Picea abies* cones (*Laspeyresia* sp.) in forests of the Igman region (*D. Luteršek*); The distribution of the genus *Melolontha* in Jugoslavia (*R. Mikšić*); The development of *Ips acuminatus* in *Pinus nigra* and *P. sylvestris* stands in the Donja Krivaja district (*Ž. Radovanović*); Control of pests on Poplar (*F. Arnautovic*); Insects attacking wood in Bosnia and Herzegovina (*E. Georgijević*); The effect of bluestain on the physico-mechanical properties of *Pinus nigra* wood (*B. Pejoski*); Preservation of wooden poles (*H. Bujukalić*); Wind breakage and windthrow in the Fojnici forest district (*F. Arnautovic*).

2080. Ozols, G. Vērojumi par priežu kulturu kaitēkļiem kāpu smiltājos 1956 gada. **[Insect pests of Scots Pine plantations on sand dunes in 1956.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (109–24). 19 refs. [Latv.russ.] N.L.L.

The investigations were made in stands up to 25 years old. The 43 species of harmful insects found are discussed. Of the Lepidoptera, *Evetria* spp. caused the most damage; of the Hymenoptera, *Gilpinia frutetorum*; of the Diptera, *Thecodiplosis brachyntera*; of the Coleoptera, *Philopedon plagiatus* and *Magdalis frontalis*; of the Heteroptera, *Aradus cinnamomeus*; of the Homoptera, *Cinara* spp.

2081. Principales insectos que atacan a las frondosas en España. **[Principal insects attacking deciduous species in Spain.]** Servicio de Plagas Forestales, Madrid. 1960. pp. 143. 40 refs. [Span.]

Presents data on morphology, biology, distribution, damage inflicted, parasites, predators and methods of control of insects damaging (1) Oaks, (2) Poplars, and (3) other deciduous species in Spain.

2082. Acatay, A. Türkiye kestane zararlılarına ilâve. **[Pests of *Castanea sativa* in Turkey.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (11–5). 6 refs. [Turk.g.]

Short notes on *Rhynchites betulae*, *Xyleborus dryographus*, *Platypus cylindrus* and *Nepticula* sp.

2083. Wettstein, O. Über drei Eichenschädlinge. **[Three pests of Oak.]** *Allg. Forstztg.* 71 (19/20), 1960: *Suppl.* (*Informationsdienst* No. 37). pp. 2. [G.]

Discusses briefly damage to shoots of young *Quercus sessiliflora* near Vienna. Insects observed included the gall wasp *Andricus quercus-radicis* (whose larvae lived in the pith and did not form proper galls), a gall moth tentatively identified as *Stenolechia gemella*, and *Rhynchites interpunctatus*. These insects cause bushy growth in youth, but trees recover their normal habit later.

2084. Ceballos y Fernández de Córdoba, G., and Dafauce Ruiz, C. Principales plagas de los chopos en España. **[Principal pests of Poplars in**

Spain.] *Montes, Madrid* 16 (94), 1960 (327–42). [Span.]

Brief notes on the pests, the type of damage they inflict, and the best methods of control.

2085. Lozinskij, V. A., and Sirotina, M. I. Kratkosročnye prognozy razmnoženij vreditelej lesa. **[Short-term predictions of mass outbreaks of forest insect pests.]** *Lesn. Hoz.* 12 (3), 1960 (37–9). [Russ.]

Discusses the merits of determining the degree of parasitization by egg analysis, by larva analysis, and by haematological investigations on the larvae, and the basing of accurate short-term predictions of insect populations on these findings.

2086. Heller, R. C., Aldrich, R. C., and Bailey, W. F. **Evaluation of several camera systems for sampling forest insect damage at low altitude.** *Photogramm. Engng.* 25 (1), 1959 (137–44). 7 refs. L.S.

Large-scale colour photographs can be used to appraise damage caused by several forest insects, but the blurring inherent in large-scale photography neutralizes the advantages of having a large image. Several camera systems were given limited tests to find a simple and inexpensive way of overcoming image-motion. The authors consider that this can best be done by using cameras equipped with extremely fast shutters. [Cf. *F.A.* 22 Nos. 2142–3.]

Insects: Natural and Biological Control

See also Nos. 1947–8, 2096, 2100–1, 2104, 2110, 2115–6, 2119–20, 2122, 2125–7, 2132, 2134–5, 2146–7, 2155–8, 2160, 2162–4, 2166–7.

2087. Telenga, I. A. **Biological method of pest control in [agricultural] crops and forest plants in the U.S.S.R.** [*Proc.*] *IX International Conference on Quarantine and Plant Protection, Moscow* 1958. pp. 15. [E.] 8 tbls. (There is also a Russian version of the paper.) I.M.I.

A short survey of Soviet work on biological control of insect pests by means of insect predators and pathogenic micro-organisms with and without supplementary chemical control. [Cf. *F.A.* 21 No. 582.]

2088. Balch, R. E. **The approach to biological control in forest entomology.** *Repr.* from *Canad. Ent.* 92 (4), 1960 (297–310). 37 refs.

Discusses the general approach to biological control of forest insects in Canada, and some of the basic principles involved, in relation to a brief review of two recent projects in the Maritime Provinces, viz. control of (1) *Diprion hercyniae* and (2) *Adelges piceae*.

2089. Madelin, M. F. **Internal fungal parasites of insects.** *Endeavour* 19 (76), 1960 (181–90 + 7 photos). 25 refs.

Although fungi that grow on insects have long been studied, the special physiological characteristics associated with their entomogenous habit have been much neglected. A short review of the literature shows that such studies are of more than academic interest. A greater knowledge of the behaviour and physiology of fungi parasitizing insects is essential for attempts to effect the control of insect pests by fungi.

2090. Ceballos [y Fernández de córdoba], G. Cuatro icneumónidos parásitos de insectos de interés forestal. **[Four ichneumon flies, parasites of forest pests.]** *Bol. Serv. Plagas For., Madrid* 3 (5), 1960 (15–6). [Span.]

Describes briefly (1) *Anilastus ebeninus* parasitic on *Thaumetopoea pityocampa*, (2) *Exochus torrenti* on *Dioryctria mendacella*, (3) *Ephialtes carbonarius* on *Pissodes* spp., and (4) *Ichneumon sexannularis* on *Paranthrene tabaniformis*.

Insects: Chemical Control (General)

See also Nos. 2098, 2121–3, 2129–30, 2133, 2136, 2139–41, 2148, 2154, 2156, 2158, 2173, 2499.

2091. Nikišin, E. V. Učet ėffektivnosti aviahimbor′by metodom parnyh vetvej. **[Rating aerial chemical control by means of paired branches.]** *Lesn. Hoz.* 12 (8), 1960 (36–7). [Russ.]

A method used in the Oak forests of Soviet Moldavia to assess the effectiveness of aerial dusting in controlling various insect defoliators is as follows. Two or three pairs of branches of approximately equal development, symmetrically disposed in the crown, are chosen and marked, on 1–2 trees/100 ha. One of each pair of branches is sawn off before dusting, and the harmful larvae on it are counted. The remaining branch of each pair is sawn off some 8–10 days after dusting, and the count of larvae compared with that of the first branch. The method is claimed to be accurate, cheap and speedy.

2092. Hartzell, A., and Wilcoxon, F. **The importance of wetting agents as affecting the toxicity of certain insecticides.** *Contr. Boyce Thompson Inst.* 20 (7), 1960 (421–4). 5 refs.

Tests with sprays of malathion and a similar toxicant (S-(2,3-dicarbomethoxypropyl)-O, O-dimethyl phosphorodithioate) for mite control were made (*a*) with the addition of a wetting agent (an alkyl aryl polyether alcohol) and (*b*) in ordinary water; test plants were also sprayed (*c*) with the wetting agent alone. Maximum kills were (*a*) 88 (*b*) 31, and (*c*) 30%.

2093. Kudler, J. Příspěvek k poznání reziduální toxicity přípravků na bázi DDT. **[Residual toxicity of DDT-based preparations.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (5), 1960 (375–86). 20 refs. [Cz.russ.g.]

In laboratory experiments the residual toxicity of warm and of cold 10% aerosol (1–6 litres/ha.), and of 5% dust (10–40 kg./ha.), applied to forest litter, was tested on cocoons of *Parasetigena agilis*, and also on house flies. In all cases, toxicity gradually decreased, lasting 3–5 days.

2094. Treece, R. E., and Matthysse, J. G. **Use of systemic insecticides on woody ornamental plants.** *Bull. Cornell Agric. Exp. Sta.* No. 945, 1959. pp. 30. 37 refs.

Used as aqueous emulsions applied to soil, all preparations tested were effective in killing mites on young evergreens (kept in wind tunnels to eliminate vapour). Mortality increased for 3 days, but little thereafter. Thimet, tested for persistence in the soil, remained available for at least 7 days, but lost much of its effectiveness after two. Dosages and concentrations of systemics were uneconomic against mites. Thimet, at 10 lb./acre, applied to the soil as 2% granules, greatly reduced the number of tips infested by *Rhyacionia frustrana* on *Pinus thunbergii*. Applied to stems, and single leaves, most systemics were translocated upwards in *Betula*, *Malus*, *Prunus*, *Juglans*, *Tilia* and other species. Only Isolan was translocated markedly downwards, and Thimet was in general absorbed and translocated poorly. Non-terminal stem applications were more effective than leaf applications. *Fenusa pusilla* on Birch was controlled by main-stem treatment with 5% concentrations of some active principles, in May, but only imperfectly in June. When one half of a leaf of *Tilia cordata* was treated, *Therioaphis tiliae* was controlled on the whole leaf treated, but only imperfectly on neighbouring leaves. No mortality was observed in *Pineus strobi* after stem applications of 5% concentrations, or in *Malacosoma americana* after highly concentrated applications adjacent, below, or above the tents. As dilute foliage sprays, systemics were effective against many pests, including *Gossyparia spuria* on Elm and *Diaspis carmeli* on Juniper, and other scale insects (except *Matsucoccus resinosae* against which only demeton gave partial control), *F. pusilla*, and many lepidopterous leaf-feeders, including *M. americana*, Phosdrin being the most effective against the last group.

2095. MORRIS, R. C. **Control of Cottonwood insects with a systemic insecticide**. *J. For.* 58 (9), 1960 (718).

Observation at the end of the 1959 growing season, 6 months after planting two plots in the Mississippi River Delta, each with (*a*) 100 cuttings dipped in dust containing 44% Thimet plus activated carbon, and (*b*) 100 untreated controls, showed fewer than one attack by *Gypsonoma haimbachiana* per 15-in. terminal in (*a*) vs. nearly 6 in (*b*). This treatment also gave highly significant control and prevention of damage by two leaf beetles, *Chrysomela scripta* and *Metachroma* sp., a clearwing borer, *Paranthrene dollii*, and leafhoppers, chiefly *Homalodisca coagulata*, the suspected vector of a leaf-curl disease that affected (*b*). First-year differences in height were highly significant; mean heights were 14·2 ft. for (*a*) vs. 10·8 for (*b*) on one plot (a fine sandy loam) and 11·2 vs. 10·1 on the other (silty loam). A few plants similarly treated in 1958 were heavily attacked by insects in 1959, indicating that the treatment is not effective after one year. [Cf. *F.A.* 21 No. 3445.]

Hemiptera

See also Nos. 2018, 2080, 2088, 2094–5.

2096. VANDERPLANK, F. L. **The bionomics and ecology of the red tree ant, *Oecophylla* sp., and its relationship to the Coconut bug *Pseudotheraptus wayi* Brown (Coreidae)**. *J. Anim. Ecol.* 29 (1), 1960 (15–33). 17 refs.

This study of *Oecophylla* sp. in Zanzibar covers: distribution; life history including laboratory and field experiments in rearing colonies; estimation of population size by feeding with P^{32}; parasites and predators; predation (particularly of *P. wayi*); Movements of colonies and distribution in Coconut plantations; value in *P. wayi* control; the effect of insecticidal sprays. [Cf. *F.A.* 15 No. 442.]

2097. CROOKE, M. ***Adelges cooleyi*, an insect pest of Douglas Fir and Sitka Spruce**. *Leafl. For. Comm., Lond.* No. 2 (rev.) 1960. pp. 8. Price 9*d.* [Cf. *F.A.* 18 No. 1856.]

2098. KOTSCHY, K. Untersuchungen über die Tannentrieblaus *Dreyfusia nüsslini*. **[Investigations on *D.* [*Adelges*] *nüsslini*.]** *Cbl. ges. Forstw.* 77 (3), 1960 (127–55). 44 refs. [G.g.]

Describes observations on life history, phenology etc., and control tests, in the Austrian Alps [cf. *F.A.* 19 No. 3194], including some observations on the full life cycle on *Abies nordmanniana* and *Picea orientalis* near Vienna. Contrary to experience in other parts of Europe [cf. *F.A.* 20 No. 3415] infestations were still heavy after the cold winter of 1956, possibly because of snow protection. In the laboratory, most *sistens* larvae survived 5 days at −20° C. Contact insecticides (Forstviton and toxaphene 1%) were most effective in September, when the population consisted mainly of *neosistentes* with little wax wool protection, and there were few or no eggs. Spring treatments before oviposition were not possible because of snow. The fogging technique used depended for its effectiveness on weather. Metasystox was most effective in late May when plant growth was most active, but no insecticide gave complete control in one treatment. However, when in small-scale trials young Silver Firs were sprayed completely with diluted viscous deer repellent (Arbinol or Monacol) in early October, all larvae (in the *neosistens* stage) were killed, and the trees developed healthy shoots the following spring. Spraying had to be done in dry weather.

2099. CARROLL, W. J., and BRYANT, D. G. **A review of the Balsam woolly aphid [*Adelges piceae*] in Newfoundland.** *For. Chron.* 36 (3), 1960 (278–90). 12 refs.

First recorded in Newfoundland in 1949, this is now the most serious forest insect pest in the Province, its host being *Abies balsamea*. The outbreak is described and possible control measures discussed.

2100. MITCHELL, R. G. **The biology of the Balsam woolly aphid, *Chermes piceae* Ratz., in Oregon and Washington and the identification and evaluation of its native predators.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (434). O.R.S.

Presents the results of studies in 1957–59. The biology of the insect is described. Fourteen insects (10 Diptera, 3 Neuroptera and 1 Coleoptera) and 2 mites were found as predators, and 9 other species of arthropods that may be predaceous were collected. The most important predators were *Cnemodon rita*, *Syrphus vitripennis*, *S. opinator* and *Metasyrphus lapponicus*; *Hemerobius neadelphus* was also moderately abundant. Evaluation studies on two areas in Oregon showed that no significant predation was effected by the aggregate predator complex.

2101. CLARK, R. C., and BROWN, N. R. **Studies of predators of the Balsam woolly aphid, *Adelges piceae* (Ratz.) (Homoptera: Adelgidae). VII. *Laricobius rubidus* Lec. (Coleoptera: Derodontidae), a predator of *Pineus strobi* (Htg.) (Homoptera: Adelgidae).** *Canad. Ent.* 92 (3), 1960 (237–40). 8 refs. O.R.S.

Short notes on life history and habits. *L. rubidus* is not a common predator of *A. piceae*, but is included in the series because of its close taxonomic similarities to *L. erichsonii*, which is.

2102. BRADLEY, G. A. **A new species of the genus *Cinara* Curtis (Homoptera: Aphididae) from *Tsuga heterophylla* (Raf.) Sarg.** *Canad. Ent.* 92 (8), 1960 (605–8). O.R.S.

A description of *C. tsugae* sp.nov., with notes on life history and distribution. This species is the only one of the genus known to live on *T. heterophylla.*

2103. RICHARDS, W. R. **A new species of *Moniella* Oestlund, with a synopsis of the aphids attacking Hickory and Walnut in Canada.** *Canad. Ent.* 92 (3), 1960 (221–30). 21 refs. O.R.S.

Describes 6 aphid species attacking Hickory and Walnut in Canada, and gives a key. A new species, *Moniella microsetosa*, is included.

2104. HARPER, A. M. **Gall aphids on Poplar in Alberta. II. Periods of emergence from galls, reproductive capacities, and predators of aphids in galls.** *Canad. Ent.* 91 (11), 1959 (680–5). 9 refs. O.R.S.

Presents data based on observations over the years 1953–57 in S. Alberta. (1) *Pemphigus betae* and (2) *P. populiglobuli* began emergence in late June or early July and had generally completed 90% of emergence 3–4 weeks later. (3) *P. populicaulis*, (4) *P. populitransversus*, (5) *P. mortonii*, and (6) *P. populiramulorum* began emergence 1–2 weeks later than (1) and (2). Emergence was 90% completed by (5) in early August, by (4) and (6) in late August, and by (3) in early September. (7) *Mordwilkoja vagabunda* began emergence 1–2 weeks after (3), but generally completed 90% of its emergence in ca. 3 weeks. Number of aphids emerging from galls of (7) averaged >10 times that of (1) and of (2), 8 times that of (6), 3–4 times that of (3) and of (4), and twice that of (5). Fundatrices of (1) had the lowest mean reproductive potential (r.p.) i.e. 164, and (7) the highest i.e. 922. The mean r.p.'s of the fundatrices of (2), (3), (4) and (5) were 185, 340, 428 and 535 respectively. The fundatrigeniae of (7) had the lowest mean r.p., i.e. 11·1, and of (5) the highest i.e. 27·4. The r.p.'s of the fundatrigeniae of (1), (2), (4) and (3) were 13·3, 17·9, 19·4 and 19·6 respectively. As the r.p. of the fundatrices increased, there was an increase in the number of fundatrigeniae leaving the galls and also in the % of potential progeny that emerged. The most important predators of gall aphids on Poplars in S. Alberta were *Anthocorus antevolens*, *Syrphus bigelowi*, *Leucopis pemphigae* and *Scymnus* sp. *From author's summary.*

2105. KNECHTEL, W. K., and NEGRU, S. Einige für die Rumänische Volksrepublik neue Schildlausarten. **[Some scale insects new to Rumania.]** *Rev. Biol., Bucarest* 4 (1), 1959 (87–93). 8 refs. [G.] O.R.S.

Parthenolecanium fletcheri on *Thuja occidentalis*, *Carulaspis visci* on *T. orientalis*, and *C. minima* on *Juniperus communis.*

2106. RICHARDS, W. R. **A new species of *Matsucoccus* Cockerell (Homoptera: Coccoidea).** *Canad. Ent.* 92 (3), 1960 (179–81). 7 refs. O.R.S.

M. macrocicatrices found on *Pinus strobus.*

Lepidoptera

See also Nos. 1381–2, 2079–80, 2082–3, 2090, 2094–5, 2180.

2107. Regulerende invloed van voedselplant op insekt. **[The food plant as a factor in the regulation of insect populations.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 48, 1960 (20–3, 33). [Du.e.]

Laboratory studies with *Bupalus piniarius* in 1959 showed that at the higher of the two temperatures used there were more larval stages, the larval stage was prolonged, and pupae were larger and heavier. Pine needles (analysed weekly) from two plantations of different site quality did not differ significantly in mineral content, and the nature of the food had no effect on mortality and growth of the larvae. Field studies showed that the water content of the needles varied slightly with the amount of water supplied (by rainfall with or without supplementary watering), but that the difference had no effect on mortality. In experiments with *Lymantria dispar* and *Malacosoma neustria* fed on Oak leaves from a variety of sites, leaves from the N. side of trees proved less suitable as food than those from the top or from the S. side, differences between the two latter groups being probably not significant. A negative correlation was found between the number of individuals surviving and the % of dry matter in the leaves, which varied from 24·3 to 32·4% between sites; there was also a negative correlation between weight of pupae and % of dry matter, within each group of pupae (on leaves from the N. or S. side or from the top); this suggests that factors other than moisture are involved, e.g. sugar and protein content of the leaves.

2108. KRÁL', V. Poškodenie úrody semena smreka—*Picea cxcelsa* Link húsenicami motyl'ov *Laspeyresia strobilella* L. a *Dioryctria abietella* Schiff. na Slovensku. **[Damage to the *P. abies* seed harvest by *L. strobilella* and *D. abietella* in Slovakia.]** *Lesn. Čas.* 6 (6), 1960 (409–21). 14 refs. [Slovak.slovak.russ.g.]

An analysis was made of 75 Spruce cone and seed lots from various parts of Czechoslovakia in 1957–58, years of relatively serious attack by larvae of *L. strobilella* and *D. abietella.* Seed yield was half that of previous years, and viability was also lower.

2109. BURDICK, D. J., and POWELL, J. A. **Studies on the early stages of two California moths which feed in the staminate cones of Digger Pine**

(Lepidoptera: Gelechiidae). *Canad. Ent.* 92 (4), 1960 (310–20). 18 refs. O.R.S.

Exoteleia burkei and *Chionodes sabinianae*.

2110. Mason, W. R. M. **New hymenopterous parasites of Lodgepole Pine needle miners.** *Canad. Ent.* 92 (2), 1960 (140–7). O.B.D.

Describes 3 new parasitic Hymenoptera reared from *Recurvaria milleri* in California and *R. starki* in Alberta. Two are Braconidae, *Meteorus pinifolii* sp. nov., and *Apanteles starki* sp. nov., and the third, *Aethecerus pinifolii* sp. nov., belongs to a genus of Ichneumonidae not hitherto reported from N. America. *From author's summary.*

2111. Agenjo, R. Dos lepidópteros del haya (*Fagus sylvatica* L.), uno nuevo para la Península Ibérica y otro que se cita por segunda vez de ella. **[Two Lepidoptera of *F. sylvatica*, one reported for the first and the other for the second time from the Iberian Peninsula.]** *Bol. Serv. Plagas For., Madrid* 3 (5), 1960 (15–6 + 1 plate). [Span.]

Describes (1) *Cirrhia aurago* found in buds and on leaves and flowers, and (2) *Harpella forficella* found under bark and in decayed wood of old stems.

2112. Agenjo, R. Dos plagas de los álamos (*Populus*) originadas por "arañuelos" (*Yponomeuta* Latr.). **[Two species of *Hyponomeuta* damaging Poplars.]** *Bol. Serv. Plagas For., Madrid* 3 (5), 1960 (97–114 + 3 plates). [Span.]

Describes outbreaks of *H. gigas* in Tenerife and of *H. padella rorella* in Aranzueque, province of Guadalajara. Some points of taxonomy, and the distribution of *Hyponomeuta* spp. in Spain are reviewed.

2113. Lindquist, O. H. **Two leaf-miners on Red Oak and White Birch in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (2–3).

Notes on *Tischeria castaneaeella* on *Quercus rubra*, and an undescribed species of *Nepticula* on *Betula papyrifera*.

2114. Bakke, A. Furuskuddvikleren, *Evetria buoliana* Schiff. og *Evetria pinicolana* Dbld. (Lep., Tortricidae): en revisjon av det norske materialet. **[*E. buoliana* and *E. pinicolana*: a revision of the Norwegian material.]** *Norsk Entomologisk Tidsskrift, Bergen* 10 (4/5), 1958 (195–201). 18 refs. [Nor.e.] I.I.E.

Distinguishes and describes the two species and gives a map showing their distribution, based on available collected material.

2115. Juillet, J. A. **Immature stages, life histories, and behaviour of two hymenopterous parasites of the European Pine shoot moth, *Rhyacionia buoliana* (Schiff.) (Lepidoptera: Olethreutidae).** *Canad. Ent.* 92 (5), 1960 (342–6). 6 refs. O.R.S.

Presents descriptions and notes on life history and behaviour of *Orgilus obscurator* and *Temelucha interruptor*.

2116. Juillet, J. A. **Morphology of immature stages, life-history, and behaviour of three hymenopterous parasites of the European Pine shoot moth, *Rhyacionia buoliana* (Schiff.) (Lepidoptera: Olethreutidae).** *Canad. Ent.* 91 (11), 1959 (709–19). 6 refs. O.R.S.

Presents accounts of *Ephialtes ruficollis*, *Eulimneria rufifemur* and *Tetrastichus turionum*, all of which were introduced into Ontario over the years 1955–57.

2117. Stilwell, M. A. **Rootlet recovery in Balsam Fir defoliated by the Spruce budworm.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (5), 1960 (1).

A study was made to determine the relationship between rootlet recovery and foliage recovery in a stand of mature Balsam Fir severely defoliated every year from 1950 to 1955. By 1959, rootlet mortality in 43 out of 47 trees examined appeared to be normal, vs. 56 out of 60 showing excessive mortality in 1957. It is concluded that rootlet recovery lagged behind foliage recovery by 3 years. [Cf. *F.A.* 20 No. 4878.]

2118. Batzer, H. O. **Mined buds, a hibernation site for Spruce budworm.** *J. econ. Ent.* 53 (4), 1960 (684). 2 refs.

Examination of 3 Balsam Firs, 11, 13, and 16 ft. tall, in Sept. showed that 15–24% of mined buds were occupied by hibernating larvae. No budworms were found on the bark. The use of mined buds for hibernation may account for the persistence of budworm infestations in young Balsam stands where large populations do not ordinarily survive from year to year.

2119. Stairs, G. R., and Bird, F. T. **Unusual parasitism of the Spruce budworm.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (1).

A sample of 2nd-instar budworm larvae, transferred from a natural infestation in N.W. Ontario to Sault Ste. Marie, was placed on open-grown Balsam Fir, with trays beneath, and after their pupation the trees were carefully examined to account for as many as possible of the original larvae. Though natural budworm populations in the general vicinity of Sault Ste. Marie were very low, parasitization of the transferred larvae was unusually high. A total of 1190 larvae were recovered, and 772 (65%) of these were killed by *Apanteles fumiferanae*, *Glypta fumiferanae* and a *Clinocentrus* sp. The last of these is a very rare parasite on the budworm, and the high incidence in this study was due to the presence of its natural host (*Argyrotoxa semipurpurana*) in epidemic numbers on Oak in the adjacent stand.

2120. Thompson, H. M. **The possible control of a budworm infestation by a microsporidian disease.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (1).

A great reduction in budworm egg numbers in 1959 in Uxbridge Forest, Ontario, and subsequent low larval populations, are thought to be due to infection by a microsporidian, *Perezia fumiferanae*. [Cf. *F.A.* 20 No. 2076.]

2121. Webb, F. E. **Aerial forest spraying against Spruce budworm—a problem of mutual interest in**

Canada and the United States. *J. econ. Ent.* 53 (4), 1960 (631–3). 9 refs.

Reviews recent Canadian and U.S. operations from the point of view of differences in host forests and outbreak behaviour, spraying policy, techniques and effectiveness.

2122. Blais, J. R., and Martineau, R. **A recent Spruce budworm outbreak in the Lower St. Lawrence and Gaspé Peninsula with reference to aerial spraying operations**. *For. Chron.* 36 (3), 1960 (209–24). 17 refs.

Discusses chiefly the progress of the outbreak from 1949 to 1956; the areas sprayed between 1954 and 1958; timing of spray application in relation to insect abundance and development; effects of spraying on budworm populations and on defoliation of Balsam Fir; results of aerial defoliation surveys and egg surveys; estimated amounts of wood destroyed by the insect, and losses averted through spraying; the various natural control factors associated with the decline and eventual collapse of the outbreak. *From authors' abstract.*

2123. Blais, J. R. **A residual Spruce budworm outbreak and aerial spraying operations in the Lower St. Lawrence region in 1960**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (5), 1960 (2). 1 tbl.

The aerial spraying operations successfully reduced Spruce budworm populations in the area treated, thereby prolonging the life of trees that otherwise would have succumbed as a result of continued defoliation. They failed, however, to check the spread of this incipient outbreak, owing to wind dispersal of small larvae in summer 1959 and spring 1960. Such spread is almost inevitable and in most cases cannot be detected in time to alter a spraying programme.

2124. Silver, G. T. **The relation of weather to population trends of the black-headed budworm *Acleris variana* (Fern.) (Lepidoptera: Tortricidae).** *Repr.* from *Canad. Ent.* 92 (6), 1960 (401–10). 6 refs.

Weather records over the years 1950–58 were studied in relation to outbreaks of *A. variana* in the forests of coastal British Columbia. No specific correlations were found between air temperature and population changes. Precipitation was the only weather factor that could be directly related to the population trend of *A. variana*. Populations increased greatly after 1 or 2 years of below-average precipitation during July and August. The outbreaks studied all decreased and collapsed during or directly after periods of more than average precipitation during the later larval development stages.

2125. Wallesz, D. P., and Benjamin, D. M. **The biology of the Pine webworm, *Tetralopha robustella*, in Wisconsin**. *J. econ. Ent.* 53 (4), 1960 (587–9). 9 refs.

This webworm is a potential pest in Wisconsin as a defoliator of Red and Jack Pines. Its life history and habits were studied in a plantation of Red Pine and a natural stand of Jack Pine in the sandy Wisconsin River valley. The webworm is widely distributed throughout the eastern half of the U.S.A. and has been recorded on 10 species of Pine. An analysis of head-capsule measurements indicates six instars. A general description of eggs, larvae, cocoons, and adults is given. The larvae overwinter in sand-covered cocoons within the first inch of soil beneath the host tree. Pupation occurs in early June and adults emerge about two weeks later. Oviposition begins in early July and continues until mid-August. Larvae appear in early July and spend at least the first instar mining needles. Then they leave the needles and construct frass shelters in which several live for the remainder of the larval feeding period. They begin to abandon the nest to enter the ground to overwinter in mid-September, some remaining in the frass nest until mid-November. Eight parasites and two insect predators were found feeding on the webworm. Twig and branch foraging birds were also observed destroying frass nests and eating webworms. *From authors' abstract.*

2126. Ossowski, L. L. J. **The biological control of the Wattle bagworm, *Kotochalia junodi* (Heyl), by a virus disease. II. Large-scale experiments.** *Ann. appl. Biol.* 48 (2), 1960 (299–313). 8 refs. O.R.E.

[See *F.A.* 19 No. 700.] Suspensions of various concentrations and different origins were tested in 1957 against young and old larvae. With infestations in the prodromal stage and the larvae in their first instar, mortality was similar with suspensions containing 1000 or 500 polyhedra/cu. mm. It was less with 250 polyhedra/cu. mm., but still high enough to keep the crowns of the trees green. Against older larvae the initial mortality was too low to prevent defoliation but, 9 months after spraying, mortality had increased sufficiently to reduce the infestation to latency. Where the virus was applied during the eruptive stage, very high initial mortality resulted and defoliation was light; 9 months after spraying, however, mortality was equally high in treated and untreated plantations. Virus introduced from a distant source proved more effective than local strains, and, at the prodromal stage, was more successful in preventing defoliation. Methyl cellulose used as a sticker did not affect mortality, but skim-milk powder decreased it. Artificially disseminated virus can spread to neighbouring plantations in the years following treatment. *From author's summary.*

2127. Romanova, Yu. [Ju.] S., and Lozinskiĭ [Lozinskij], V. A. **Experiments on the practical use of egg parasites of *Malacosoma neustria* in forest conditions**. *Zoolog̀ičeskij Žurnal, Moskva* 37 (4), 1958 (542–7). 6 refs. [Russ.e.] From *abstr.* in *Rev. appl. Ent.* 48*A* (3), 1960 (93–4).

Reports experiments on the biological control of *M. neustria* made in the Ukraine, in 1954–55, when a mass outbreak of this and other Oak defoliators occurred in the Kiev district. Laboratory observations on parasitized eggs in Feb.–March 1955 showed that *Telenomus laeviusculus*, which is specific to *M. neustria*, was the predominant, and locally the only, egg parasite present. Its distribution in the U.S.S.R., mainly in forest and forest steppe regions, coincides with that of *M. neustria*, to whose development it is well adapted, parasitization of the latter's eggs sometimes amounting to 80–90%. During the summer, the adults (described) live among colonies of *M. neustria* and feed on nectar; ♀s predominate, and ♂s may be absent. During the flight period of *M. neustria*, the *Telenomus* ♀s each lay 60–70 eggs in the newly laid eggs of the host, one to each egg. Development takes place entirely in the host egg, the adults emerging in spring about a month after the larvae of *M. neustria* hatch. Both the parasite and its host have one generation a year. The other egg parasites reared, which occurred in insignificant numbers, were *Ooencyrtus neustriae*, *O. tardus* and *Trichogramma pallidum*.

The effectiveness of *Telenomus laeviusculus* varied considerably. In an old-established population of *M. neustria*, in which parasitization averaged 44%, the parasite gave good control, but it was insufficient in newly formed foci. In two areas planted with Oak saplings, batches of parasitized eggs were hung on the trees in spring 1955. In May–June, mean daily temperatures of 15–22° C. and relative humidities of 54–96% (night) and 32–78% (day) favoured emergence of adult parasites, but drying winds killed up to 46%. In December, an average of 42% of egg-masses were parasitized on the first plot. The main parasite was *T. laeviusculus*, but *Ooencyrtus* spp., *Trichogramma pallidum* and *Anastatus bifasciatus* were also present. The eggs used on the second plot were parasitized mainly by *O. tardus* and *O. neustriae*, but *Telenomus laeviusculus* comprised 40% of the parasites, and there were a few examples of *Trichogramma pallidum*. Examination of pupae of *M. neustria* during the summer showed that 45% had been killed by fungus diseases and 10% by parasites, which included *Theronia atalantae*, *Pimpla instigator*, *Pteromalus puparum* and tachinids. In the autumn, an average of 19·2% of the egg-masses were parasitized. *Telenomus laeviusculus* was the only specific parasite of *M. neustria* among those used on this plot and the one best adapted to forest conditions. Its introduction into suitable areas is recommended. Encyrtids are better adapted to orchard conditions. Parasitized egg-batches should be hung on the leeward side of the trees as soon as *M. neustria* appears in a district. *From authors' summary.*

2128. Hildahl, V., and Reeks, W. A. **Outbreaks of the forest tent caterpillar, *Malacosoma disstria* Hbn., and their effects on stands of Trembling Aspen in Manitoba and Saskatchewan.** *Canad. Ent.* 92 (3), 1960 (199–209). 14 refs. O.R.S.

A review is made of the pattern of attacks over the years 1923–53, and the effects are discussed of the latest outbreak on the stands. The outbreaks of the early '50s ended abruptly and did not cause appreciable mortality. Increment loss, however, in stands covering ca. 1½ million acres in the two provinces is estimated at 8·4% of the total b.a.

2129. Turner, N. **Cankerworms.** *Circ. Conn. Agric. Exp. Sta.* No. 214, 1960. pp. 6. 3 refs.

Describes the fall cankerworm, *Alsophila pometaria*, and the less common spring cankerworm *Paleacrita vernata*, which periodically cause heavy defoliation of broadleaved trees, particularly Apple, Elm and Oak. Spraying with DDT in early spring or banding in late autumn to intercept the emerging wingless ♀s when they crawl up the trunks to oviposit, is recommended for control in gardens etc.

2130. Simolinna, J. **Aerial control of the Pine looper (*Bupalus piniarius* L.) in Finland.** *Agric. Aviation, The Hague* 2 (3), 1960 (79–84, 100–1). [E.e.g.f.] O.R.E.

Reports control over 6305 ha. in E. Finland against larvae of *B. piniarius*, using fixed-wing aircraft (*a*) and a helicopter (*b*) to apply an 8% DDT dust at ca. 20 kg./ha. (55 ha./flying hr.) with (*a*), and ca. 15 kg./ha. (65 ha./flying hr.) with (*b*). Flying costs per ha. were 748 Finmarks with (*a*), and 729 with (*b*). If (*b*) had applied 20 kg./ha., its flying costs would have been 1075 Finmarks/ha. No definite results are available as yet on the % kill resulting.

2131. Mathur, R. N. ***Chrysocraspeda olearia* Guénee, a defoliator of *Eugenia jambolana* (Geometridae: Lepidoptera).** *Indian For. Leafl.* (*Entomology*) No. 161, 1960. pp. 4 + 1 set of drawings. 2 refs. Price *Rs.* 0.87 (1*s.* 3*d.*).

2132. Smereka, E. P. **Some notes on *Lobophora nivigerata* Walker.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (1).

This is one of the more common geometrids found on Aspen in the Cedar Lake area of N.W. Ontario in 1959. Notes are given on life history, parasites etc.

2133. Anfinnikov, M. A., *et al.* Iz opyta aviahimbor'by s sosnovoj sovkoj. **[Aerial chemical control trials against *Panolis flammea*.]** *Lesn. Hoz.* 12 (5), 1960 (42–4). [Russ.]

An account of control operation on 26,500 ha. [of Pine] in the S.E. part of the Kharkhov region from 7 May to 9 June, 1959, i.e. before and after larval emergence. DDT was applied from an AN-2 aeroplane in three ways: (1) in diesel oil, 10% concentration, at 20 litres/ha.; (2) as a 50% emulsion paste diluted with water to 7%, at 40 litres/ha.; (3) as a 5·5% dust, at 11 and 15 kg./ha. Method (1) was the most expensive, but gave 100% kill; (2) was somewhat cheaper and highly effective; (3), at 11 kg./ha., was the cheapest treatment, but gave good results only against the youngest larvae and in dry, calm weather. In variable weather, (2) and especially (1) are best for direct control of larvae. Method (1) can also be used before larval emergence and (2) also, provided that no rain follows. Control in the egg stage frees equipment for use against pests of agricultural crops in the summer.

2134. Ryvkin, B. V. **Peculiarities of outbreaks of *Lymantria dispar* and factors determining them.** *Zoologičeskij Žurnal, Moskva* 36 (9), 1957 (1355–8). 2 refs. From *abstr.* in *Rev. appl. Ent.* 47*A* (10), 1959 (357).

Anastatus disparis, the principal egg parasite of *Lymantria dispar*, is relatively ineffective in the U.S.S.R. Observations in European Russia showed that this eupelmid was not present in all outbreaks, and that parasitization by it rarely exceeded 5%. Tachinid parasites of the larvae were also ineffective as a rule, but *Apanteles porthetriae* caused considerable larval mortality, and sarcophagids reduced the number of prepupae and pupae, but were themselves parasitized. The effectiveness of *A. disparis* can be increased by collecting parasitized egg masses of *L. dispar* in autumn, destroying the *L. dispar* larvae that hatch from them in spring, and putting the remaining eggs in suitable containers that are then fastened to the trees; the adult parasites emerge in June. This method can also be used to introduce the parasite to areas where it did not previously occur.

2135. KOYAMA, R., and KATAGIRI, K. **[On the virus disease of *Lymantria fumida* Butler. I. On a virus epizootic in an outbreaking population of *Lymantria fumida* Butler. II. On the pathology of polyhedrosis [in] *Lymantria fumida* Butler.]** *J. Jap. For. Soc.* 41 (1), 1959 (4–18). 20 refs. [Jap.jap. e.*e*.]

Coleoptera

See also Nos. 1383–5, 1443, 2079–80, 2082–3, 2090, 2095, 2175, 2499.

2136. BRANDSEN, J. **Bostrychids.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 12 (1), 1960 (19–23).

Discusses the biology and habits of 7 bostrychid species and makes suggestions for controlling their attack on Wattle, Eucalypts and orchard trees in Australia by various spraying and dipping techniques.

2137. HENRY, P. W. T. ***Hecphora testator* F.—a pest attacking *Nauclea diderrichii*, its incidence at Akilla and notes on the nature of the damage to the host.** *Niger. For. Inform. Bull.* Nos. 4–7, 1960 (18–20).

The % of trees attacked increases sharply in the second and third years of growth (26·25 and 60·3% respectively) and during the next 5 years drops to a range of 0–9%. In natural forest conditions the insect is probably a secondary cause of death and its incidence may be related to that of swollen-butt defect in the tree.

2138. BUCHANAN, W. D. **Biology of the Oak timberworm, *Arrhenodes minutus*.** *J. econ. Ent.* 53 (4), 1960 (510–3).

In Missouri, *A. minutus* makes "pin holes" that degrade or even destroy the value of potential products obtained from many Oak trees. The eggs are laid in blazes and other wounds that expose the bare wood on living trees. The larvae make their galleries across the grain of the wood, and keep them clean by pushing borings, etc. out of them through hair-sized holes made in the wood by the parent ♀s. The life cycle lasted 2 years for 3 specimens, 3 years for 122, and 4 years for 1 specimen. Pupation takes place near the exit from the larval gallery. No evidence of attack was found in Black and Scarlet Oak trees that had not been wounded, but attacks were made through wounds in ca. 50% of the trees that were blazed in March, 78% of those blazed in May, 60% of those blazed in June, and 14% of those blazed in late July. In general, wounds <3 weeks old seemed to be more attractive sites for egg deposition than older wounds, but in a few instances eggs were laid in wounds that were 2 years old. However, eggs were not laid in wounded trees of < 5·5 in. d.b.h., regardless of the age of the wound. *From author's abstract.*

2139. CHURAKOV [ČURAKOV], A. M. **The acorn weevil.** *Zoologičeskij Žurnal, Moskva* 36 (5), 1957 (700–14). 15 refs. [Russ.e.] From *abstr.* in *Rev. appl. Ent.* 47*A* (10), 1959 (356).

Insect pests and diseases are mainly responsible for an insufficiency of Oak seed in European Russia, and *Curculio glandium* is the most important of the former. Eggs are laid in the acorns in July–Sept. The larvae hatch in 6–10 days and feed on the cotyledons for 30–37 days, after which they enter the soil (mostly in Aug. and Sept.), overwinter, and pupate in the following July. The pupal stage lasts 12–18 days, and the newly emerged adults remain in the pupal cells until the following spring. In tests, the larvae were unaffected by deposits of DDT or BHC, but the adults were fairly susceptible, and these materials should therefore be applied in aerosol form during adult feeding and oviposition. Aerial applications have given good control.

2140. SCHREAD, J. C. **The black vine weevil.** *Circ. Conn. Agric. Exp. Sta.* No. 211, 1960. pp. 4. 5 refs.

A short account of *Brachyrhinus sulcatus*, a nursery pest of *Taxus* and *Tsuga* spp., and its control. Spraying with DDT or chlordane (1 lb./100 gal. water) has proved a successful control measure.

2141. NENONEN, M., and JUKOLA, J. Tukkimiehen täin (*Hylobius abietis* L.) tuhoista mäntytaimistoissa ja niiden torjunnasta DDT : n avulla. **[Pine-weevil (*H. abietis*) injuries and their control by DDT in Scots Pine seedling stands.]** *Silva fenn.* 104 (2), 1960. pp. 30. 44 refs. [Fi.fi.e.*e*.]

In a study of a number of established young Scots Pine stands, experiments were made in protection by dipping stock in a DDT emulsion before planting. The most extensive damage was found where Pine had been planted on the site of clear-felled, burnt-over old Spruce stands; damage was greater in stands established by planting than in those originating from direct sowing or natural seeding; it was less where planting had been done on patches cleared of litter and humus. Dipping planting stock from tip to root collar in DDT emulsion is a cheap and effective protective measure. *From authors' summary.*

2142. ALDRICH, R. C., BAILEY, W. F., and HELLER, R. C. **Large scale 70 mm. color photography techniques and equipment and their application to a forest sampling problem.** *Photogramm. Engng.* 25 (5), 1959 (747–54). 5 refs. L.S.

[Cf. *F.A.* 22 No. 2086.] Describes a photographic sampling technique that overcomes the image-motion problem by using a fast colour film on a 70-mm. camera with a fast shutter. Special equipment and methods used in taking the pictures, and in processing and interpreting them, are explained in detail. This technique was recently introduced to forestry by the Forest Insect Laboratory at Beltsville, Md., when an aerial photosurvey was made to assess damage caused by the White Pine weevil [*Pissodes strobi*] in Pine plantations in New York State. Data obtained from the photographs were used to evaluate the success of an experimental aerial spraying operation for weevil control. Results showed that infested trees could be counted on a 1 : 600 scale with 90% accuracy at a cost 20% less than with conventional ground methods. *From authors' abstract.*

2143. HELLER, R. C., ALDRICH, R. C., and BAILEY, W. F. **An evaluation of aerial photography for detecting Southern Pine beetle [*Dendroctonus frontalis*] damage.** *Photogramm. Engng.* 25 (4), 1959 (595–606). 8 refs. L.S.

A large-scale experiment was made to determine the usefulness of special aerial photography to locate and appraise insect-killed timber in the mountains of N. Carolina. Previous tests had narrowed down the selection of films to colour and panchromatic with a red filter (A-25). Interpretations made on colour film were more accurate than those made on panchromatic. A scale of 1 : 7920 was the best compromise between accuracy and cost. Although colour photography was more expensive than aerial sketch-mapping, it was also more accurate. Ground cruising proved to be the most expensive and time-consuming survey method. It is concluded that colour photography would be most useful where it is necessary to map the location of infested trees with a high degree of accuracy—particularly on expensive barkbeetle control operations. *From authors' abstract.*

2144. NISHIGUCHI, C. **[Species compositions of swarms of Spruce bark- and wood-inhabiting beetles and their seasonal change.]** *J. Jap. For. Soc.* 41 (7), 1959 (270–4). 9 refs. [Jap.jap.e.*e*.]

Presents the results of observations made on *Picea abies* trap logs set in 1957 and 1958 to analyse the composition of barkbeetle swarms in the Tokyo University Forest, Hokkaido. In the 1957 swarming periods: (i) (Apr. 21–May 15, often with daytime temperatures of 15–20° C.) *Hylurgops glabratus*, *Xyloterus lineatus* and *Blastophagus piniperda* predominated; (ii) (May 23–June 8, at 20–23°) *Ips typographus* f. *japonicus* and *H. inouyei* predominated; (iii) (June 17–July 9) *Tetropium castaneum* and *Dryocoetes* spp. predominated; (iv) (July 16–30) *Monochamus urssovii* continued to emerge, swarming by most other species having ceased; (v) (Aug.) only *Coelosternus* sp. emerged abundantly. In 1958 swarm composition was drastically changed through effective chemical control [tabulated data on spraying with BHC given in English], marked decreases in the populations of some species being recorded.

2145. MRKVA, R. Kůrovci Novohradských hor. **[Barkbeetles in the Novohradske Mts.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (5), 1960 (409–18). 21 refs. [Cz.cz.russ.g.]

A zoo-coenological study. *Ips typographus*, *I. amitinus* and *Pityogenes chalcographus* are the most dangerous species in the Spruce and Pine forests of the region, which are subject to wind, snow and ice damage. Changing the composition and structure of the stands and making them more like natural stands is recommended as the best way of creating forests resistant to barkbeetle attack.

2146. KALANDRA, A. Příspěvek ke gradologii kůrovce smrkového *Ips typographus* L. **[Population dynamics of *I. typographus*.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 6 (5), 1960 (345–64). 92 refs. [Cz. cz.russ.g.]

The findings of studies on two trap trees, covering generations, population dynamics, and the effect of predators, parasites and environmental conditions on numbers.

2147. DOANE, C. C. **Bacterial pathogens of *Scolytus multistriatus* as related to crowding.** *Journal of Insect Pathology, New York* 2 (1), 1960 (24–9). 7 refs. O.R.S.

Describes laboratory tests on the pathogenicity of *Aerobacter scolyti*, *Escherichia klebsiellaeformis* and *Serratia marcescens* to last-stage larvae of *Scolytus multistriatus*. It was shown that the larvae will bite each other on contact and that the 3 bacteria studied may infect through these injuries. Crowding of the larvae increased the number of bites and hence the efficiency of these bacteria as pathogens. Conversely, the bacteria were not able to infect many uninjured larvae, irrespective of length of exposure.

2148. AL-AZAWI, A. F. **Prevention of *Scolytus multistriatus* transmission of *Ceratocystis ulmi*, the Dutch Elm disease fungus, by systemic insecticides.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (10), 1960 (3907). O.R.S.

The toxicity of various organophosphate systemic insecticides and DDT to the beetle was studied in the laboratory, using freshly cut Elm twigs. The order of descending toxicity was: (Thimet [phorate-type], dimefox, and Bayer 19639), DDT (demeton, Am. Cyanamid 12880 and 18706), Chipman R-6199 and R-6200. In the field, systemic insecticides were applied by trunk injection, and toxicity was studied by a beetle bio-assay method, and uptake, translocation and persistence of the insecticide by tissue analysis. When leaves were present, insecticides moved up immediately and were detectable within a day, but their distribution between branches was not uniform. R-6199, demeton, dimefox and Thimet persisted in the foliage for over 17 weeks. By the second season, R-6199 was reduced to $\frac{1}{24}$ of the original p.p.m. in the foliage and to $\frac{1}{7}$ in the twig bark; it was also found in the trunk bark. There was evidence that R-6199 prevented beetles from breeding in logs of treated trees. Bio-assay of twigs from treated trees showed that R-6199 was more toxic and more efficient in reducing the extent of beetle feeding than demeton, dimefox and Thimet. Some details of its effect on beetle mortality and fungus transmission are given [cf. *F.A.* 21 No. 2129]. Bio-assay of trees treated with DDT showed spring application to give better control of beetles and of fungus transmission than autumn application. No conclusive results were obtained on beetle preferences for the American, Chinese, Buisman, Moline and Vase clones of Elm.

2149. GAUSS, R. Ist *Xylosandrus germanus* Bladf. ein Primärschädling? **[Is *X. germanus* a primary pest?]** *Anz. Schädlingsk.* 33 (11), 1960 (168–72). 17 refs. [G.]

In support of the thesis that *X. germanus* is a secondary pest, an example is cited of saplings of *Acer pseudoplatanus* damaged by frost in the Baden-Baden district and found to be inhabited by *X. germanus*. Observations are presented on the pattern of the larval galleries, and on populations within some infested stems.

2150. NOVÁK, V. Dřevokaz čárkovaný a boj proti němu. **[*Trypodendron lineatum* and its control.]** Státní Zemědělské Nakladatelství, Prague. 1960. pp. 131. 41 refs. [Cz.] Price *Kčs.* 6.

A monograph covering systematy, distribution, bionomics, damage, prevention and control, etc.

2151. CHAPMAN, J. A. **Overwintering mortality in the ambrosia beetle *Trypodendron* [*lineatum*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (3–4).

Results of this study confirm previous findings that mortality from all causes is very low. [Cf. *F.A.* 21 No. 3492.]

2152. BAKER, J. M. **Ambrosia beetle attack on living *Baikiaea insignis* subsp. *minor*.** *Emp. For. Rev.* 39 (3), 1960 (341–3). 5 refs.

One log, when peeled, was found to have internal damage by ambrosia beetles, with associated stain. The tree had been attacked when small but had recovered, the tunnels being obliterated. Two species of Platypodidae were responsible, but specimens were too fragmented for identification. It was shown that the attack had not resulted in the rearing of broods, and that the staining was due not to fungi but to gum or resin produced by the tree. *Author's summary.*

2153. PAWŁOWSKI, J. Wynurt (*Ceruchus chrysomelinus* Hochw.) i kostrzeń (*Sinodendron cylindricum* L.) w Białowieskim Parku Narodowym. **[*C. chrysomelinus* and *S. cylindricum* in the Białowieża National Park.]** *Folia for. polon.* (*Leśn.*) No. 2, 1960 (101–12). 10 refs. [Pol.russ.e.]

Description, ecology, life history and natural controls. Both insects are found mainly in Spruce/Hornbeam forests, the larvae living in fallen decayed Spruce stems.

2154. Bestrijding van *Polyphylla* met insecticiden. **[Control of *P.* [*fullo*] with insecticides.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 48, 1960 (12, 32). [Du.e.]

Tree plantings on the dunes at Meyendel have been attacked. A study of preferred ground-cover plants showed that *Hippophaë* and *Ligustrum* spp. are among species distasteful to the insect. Young trees treated with lindane or aldrin powders or emulsions were much less damaged than controls. Powders were more effective but are too expensive for practical use. [Cf. *F.A.* 20 No. 2057.]

Hymenoptera

See also Nos. 1386, 2018, 2080, 2083, 2088, 2094.

2155. **Biological control of *Sirex*.** *N.Z. Timb. J.* 7 (1), 1960 (76).

A note supplied by the Forest Research Institute, Rotorua, shows that the introduced *Sirex noctilio*, although regarded as a secondary pest, attacking debilitated trees, is nevertheless of major importance, e.g. in the epidemic of 1946–49, following a drought. The introduced *Rhyssa persuasoria* (1928–31) and the native *Guiglia schauinslandi* are both larval parasites of *Sirex*. The egg parasite, *Ibalia leucospoides*, introduced in 1950–51 [cf. *F.A.* 15 No. 504], is established in many of the exotic forests. Released in Rotorua forest in 1955, it was found to have parasitized 45% of the *Sirex* found in logs there in 1959. This, the most important parasite, working with the others, plus good silvicultural practices, should prevent the recurrence of large epidemics.

2156. RUMPHORST, H., and GOOSSEN, H. Beitrag zur Biologie und Bekämpfung der stahlblauen Kiefernschonungsgespinstblattwespe (*Acantholyda erythrocephala*). **[The biology and control of *A. erythrocephala*.]** *Anz. Schädlingsk.* 33 (10), 1960 (149–54). 14 refs. [G.g.]

Observations are presented on an outbreak of *A. erythrocephala* in the Hohe Mark, Haard and Üfter Heide over the years 1952–56. The pest preferred *Pinus strobus* to *P. sylvestris*, pole-stage and mature stands to young plantations, and forest margins to the stand interior (except the edge of clearings). Data are given on phenology, characteristic damage, larval hibernation and natural enemies. Results of tests with contact insecticides (mainly DDT and BHC) are given. Dusts gave quicker results than aerosols or sprays. Treatment of the ground cover proved useful, but no good purpose was served by working the insecticide into the soil.

2157. HENZE, and SCHWENKE. Die Vögel als Vertilger der Kiefern-Buschhornblattwespenkokons in Bayern 1959/60. **[Birds as predators of *Diprion pini* cocoons in Bavaria, 1959–60.]** *Allg. Forstzeitschr.* 15 (44), 1960 (634–6). [G.]

After an epidemic during the hot summer of 1959, flocks of tits gathered to feed on pupae near the infested stems. Stands in an area where 1200 nesting boxes/2000 ha. and winter food had been supplied (*a*) were compared with stands without bird encouragement (*b*). Where pupal densities were 20–40 sq. m. the % of empty pupae was 25·3 in (*a*) and 18·1 in (*b*); where pupal densities were 90–120, 18·1% in (*a*) and 5·4% (*b*), and in stands with densities of 90–120, which had been cleared of litter, so that pupae were more easily found by the birds, they reached 58·8% in (*a*) and 46% in (*b*). Defoliation in (*a*) was visibly less than in (*b*).

2158. COPPEL, H. C., and NORRIS, D. M., JR. **Systemic insecticides for control of the introduced Pine sawfly, *Diprion similis*, with notes on parasite survival.** *J. econ. Ent.* 53 (4), 1960 (648–50). 2 refs.

Injection of White Pines [*Pinus strobus*] of 4- to 6-in. d.b.h. with phorate, demeton, Chipman

R-6199 (O,O-diethyl S-(2-diethylamino) ethyl phosphorothiolate (hydrogen oxalate salt)), and Shell 3562 (dimethyl 1-(dimethylcarbamoyl)-1-propen 2-yl phosphate) resulted in sufficient translocation into the needles to kill feeding larvae of the sawfly. Chipman R-6199 remained toxic to the larvae for 2 years. Phytotoxicity was not observed in any of the injected trees. Hymenopterous and dipterous parasites caged with foliage from injected trees were not adversely affected by the systemics in the foliage. *From authors' abstract.*

2159. THALENHORST, W. Zur Kenntnis der Fichtenblattwespen. VI. Die Populationsdichte der Diprionidae: Niveau und Fluktuationen. [**Spruce sawflies. VI. Population density of the Diprionidae: level and fluctuations.**] *Z. PflKrankh.* 67 (9), 1960 (513–24). 14 refs. [G.g.e.] E.M.B.

In the southern part of Niedersachsen, the population density of larvae of *Diprion* spp. reached minima in 1953 and 1958, with a maximum in 1955. Density was lower at 580 m. alt. than at 300 m. The proportions of *D. abieticola*, *D. polytoma* and *D. hercyniae* were roughly 1/2/2.

2160. NEILSON, M. M., and ELGEE, D. E. **The effect of storage on the virulence of a polyhedrosis virus.** *Repr.* from *Journal of Insect Pathology, New York* 2 (2), 1960 (165–71). 8 refs.

Polyhedra from *Gilpinia hercyniae*, stored within dried larval cadavers at 4·5° C., gradually lost virulence. Time taken to kill increased from the 2nd year, and the mortality rate, at the concentrations tested, decreased from the 8th year, falling to nil by the 10th year. Material stored at room temperature, tested after 2 and 5 years, gave similar reactions. Neither the virulence of polyhedra freshly collected, nor the resistance of freshly collected larvae had changed over the period.

2161. GRIFFITHS, K. J. **Oviposition of the red-headed Pine sawfly, *Neodiprion lecontei* (Fitch).** *Repr.* from *Canad. Ent.* 92 (6), 1960 (430–5). 7 refs.

Presents data on egg number in relation to needle length, egg spacing in relation to needle width, and the interaction of needle length and width on egg numbers.

2162. KAPLER, J. E., and BENJAMIN, D. M. **The biology and ecology of the Red Pine sawfly in Wisconsin.** *For. Sci.* 6 (3), 1960 (253–68). 18 refs.

Reports in detail a 3-year observational and experimental study of *Neodiprion nanulus nanulus*, covering distribution, tree hosts, taxonomy, instar description, biology, ecology, natural control, diseases, mortality, and effect on host plant. The introduced *Dahlbominus fuscipennis* parasitized 65, 39 and 74% of all the cocoons parasitized in successive autumns, proving itself the most important parasite.

2163. FINLAYSON, T. **Taxonomy of cocoons and puparia, and their contents, of Canadian parasites of *Neodiprion sertifer* (Geoff.) (Hymenoptera: Diprionidae).** *Canad. Ent.* 92 (1), 1960 (20–47). 48 refs. O.R.S.

The first of a series of papers in which it is planned to study the characters of taxonomic significance in the cocoons and puparia, cast larval skins and other remains of parasitic Hymenoptera and Diptera found in or near the remains of parasitized hosts after parasite emergence. On this basis 23 species of parasite of *N. sertifer* are identified. Characters found to be of taxonomic value are the size, shape and position of the exit hole of the host cocoon, the presence or absence, and the size, shape, colour and texture, of the parasite cocoon, and the cephalic structure, spiracles and skin of the last larval instar. Descriptions of the species are given.

2164. TRIPP, H. A. ***Spathimeigenia spinigera* Townsend (Diptera–Tachinidae), a parasite of *Neodiprion swainei* Middleton (Hymenoptera: Tenthredinidae).** *Canad. Ent.* 92 (5), 1960 (347–59). 8 refs. O.R.S.

Deals with the taxonomy of *S. spinigera*, its distribution and hosts, the life cycle of the hosts, the larval stages and biology of *S. spinigera*, and some mortality factors.

2165. NAIRN, L. D., and PRENTICE, R. M. **Infestation ratings of the Larch sawfly [*Pristiphora erichsonii*] in Manitoba and Saskatchewan.** *For. Chron.* 36 (3), 1960 (225–9). 8 refs.

Larch sawfly infestations are commonly surveyed from the ground and air. Ground surveys are based on estimates of defoliation and % of Tamarack shoots utilized for oviposition. Aerial surveys are based on colour ratings discernible at 600 ft. alt. The proportional distribution of shoots and foliage of Tamarack was studied and found to be similar for four different crown types. The paper attempts to rate infestations so that either ground or aerial surveys will give comparable results. *From authors' abstract.*

2166. TURNOCK, W. J. **Ecological life-history of the Larch sawfly, *Pristiphora erichsonii* (Htg.) (Hymenoptera: Tenthredinidae), in Manitoba and Saskatchewan.** *Repr.* from *Canad. Ent.* 92 (7), 1960 (500–16). 59 refs.

Describes briefly the stages of *P. erichsonii*, reviews some general factors related to outbreaks in Manitoba and Saskatchewan, presents data on the life history of the pest, and discusses physical and biotic factors of the environment as they affect it, and also some factors controlling its population fluctuations.

2167. HERON, R. J. **The relative effects of cocoon submergence on the mortality of the Larch sawfly, *Pristiphora erichsonii* (Hymenoptera, Tenthredinidae), and its parasite, *Bessa harveyi* (Diptera, Tachinidae).** *Repr.* from *Ann. Ent. Soc. Amer.* 53 (4), 1960 (476–81). 9 refs.

[Cf. *F.A.* 20 No. 4942.] In tests at 10° C. with ca. 300 host larvae per treatment, submergence of up to 30 days in the eonymphal stage had little or no effect on host mortality or on that of the ichneumonid parasite *Mesoleius tenthredinis*, but emergence of *B. harveyi* declined after 10 days and ceased after 20. At 15° C. host mortality was little affected by 20, but considerably by 30 days. One *B. harveyi* emerged after 10 days, and none after 20 days.

Measurements of respiration suggested that differences in resistance are connected with differences in development rate and metabolism in the early part of the incubation period.

2168. MARTIN, J. L. **The bionomics of *Profenusa thomsoni* (Konow) (Hymenoptera: Tenthredinidae) a leaf-mining sawfly on *Betula* spp.** *Repr.* from *Canad. Ent.* 92 (5), 1960 (376–84). 7 refs.

Diptera

See also Nos. 1387, 2080.

2169. REEKS, W. A. **Observations on the life history, distribution, and abundance of two species of *Cecidomyia* (Diptera, Cecidomyiidae) on Jack Pine in Manitoba and Saskatchewan.** *Canad. Ent.* 92 (2), 1960 (154–60). 9 refs. O.R.S.

Deals with *C. reeksi* and *C. banksianae*.

2170. HEDLIN, A. F. **Observations on larval distribution in duff of the Douglas-Fir cone midge, *Contarinia oregonensis* Foote.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (3).

The greatest concentration of larvae was found at a distance half-way between the base of the tree and the crown perimeter; 96–97% of cocoons were found in the upper 2 in., a few went into the 3–5 in. layer but none were found below 5 in.

459. Other Animals

2171. RUEHLE, J. L., and SASSER, J. N. **The relationship of plant-parasitic nematodes to the growth of Pines in out-plantings.** *Abstr.* in *Phytopathology* 50 (9), 1960 (652).

In stunted and declining plantations of 5- to 10-year-old *Pinus elliottii* and *P. taeda*, the following plant-parasitic forms were found: *Hoplolaimus tylenchiformis* (1); *Meloidodera* sp. (2); *Helicotylenchus mannus*; and *Xiphinema americanum.* Field tests with MeBr and D-D suggested that damage was due to species indigenous in the soil rather than to species imported with the nursery stock. In greenhouse tests, all four types reproduced on both Pines, but only (1) and (2) caused serious damage by injuring mycorrhizal roots, (1) causing cell collapse and loss of mycorrhizae along most of the laterals, and (2) becoming sedentary endoparasites with their heads in the vascular cylinder.

2172. EHARA, S. **Description of a new spider mite attacking Japanese Pines.** *Annotationes Zoologicae Japonenses, Tokyo* 32 (2), 1959 (97–100). 4 refs. [E.] L.S.

A description of *Paratetranychus clavatus* sp. nov. found on *Pinus densiflora* and *P. thunbergii.* It first attracted attention in Osaka prefecture in 1958, and has since become of economic importance.

2173. STEWART, K. E., and PETERSON, L. O. T. **Control of the Spruce spider mite [*Oligonychus ununguis*].** *Publ. Dep. Agric. Can.* No. 1078, 1960. pp. 4.

A strong stream of water from a hose will wash away and destroy many mites, but better control is obtained by spraying the trees in late May with a poisonous mixture, and repeating the treatment in late June or early July. Kelthane, Tedion, Ovex, and Aramite are recommended.

2174. MORGAN, C. V. G., and HEDLIN, A. F. **Notes on the Juniper berry mite, *Trisetacus quadrisetus* (Thomas) (Acarina: Eriophyidae), in British Columbia.** *Canad. Ent.* 92 (8), 1960 (608–10). 10 refs. O.R.S.

46. Damage by Man

See Nos. 1371, 1662.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 1963–4, 2386.

2175. KREBILL, R. G., and PATTON, R. F. **Deterioration of immature Jack and Red Pine plantations in Wisconsin.** *Abstr.* in *Phytopathology* 50 (9), 1960 (642–3).

Symptoms of crown thinning, wilting, and diminishing growth, leading sometimes to total destruction in plantations of *Pinus banksiana* and *P. resinosa* on Plainfield sands, were closely associated with deterioration of feeder rootlets and decay of lateral roots. No one fungus was obtained consistently from soil or roots. In both healthy and diseased stands, many ectoparasitic or possibly parasitic nematodes were found. Weevil galleries, frequent in the lateral roots of *P. banksiana*, may have aided the entrance of fungi.

2176. MCMINN, R. G. **A study of the relationship between pole height and rooting characteristics of *Pinus monticola* Dougl.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (244). [E.] O.B.D.

The root systems of 35 pole-sized *P. monticola* were excavated. Trees showing advanced crown decadence had serious root deterioration, particularly in their absorbing elements. Certain rooting characteristics seem to predispose this species to decline.

2177. FERRELL, W. K., JOHNSON, F. D., and MICHELSEN, C. E. **Movement and distribution of radiophosphorus in crowns of healthy and pole blighted Western White Pines (*Pinus monticola* D. Don.).** *Plant Physiol.* 35 (4), 1960 (413–7). 10 refs. O.R.E.

P^{32} was injected into pole-sized (*a*) healthy and (*b*) pole-blighted trees, and its distribution determined. On the basis of activity per g. of leaf tissue, accumulations were largest in the upper crowns of (*a*) and in the lower crowns of (*b*). Calculations on a specific activity basis gave no significant differences from those based on g. of leaf tissue. Taking the tree as a whole, the rate of P^{32} movement was considerably faster in (*b*). When the extreme tops were severed, however, the rate in the severed tops was more rapid in (*a*).

2178. LINZON, S. N. **Comparative studies of growth in healthy and needle-blighted White Pine**

saplings. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (4), 1960 (1–2).

Investigations were made to determine the influence of needle blight, a disease that kills the distal portions of the current year's needles, on various aspects of the growth of *Pinus strobus*. The effects ascertained were reduction in needle and twig size and reduced height and diameter increment. These are in turn reflected in the production of fewer buds on the shoots, and fewer shoots per whorl in the following year. Where this is repeated annually, only terminal buds are eventually produced, and the tree dies.

2179. Baldwin, R. E., and Elliott, E. S. **Hemlock canker, a disease associated with poor soil drainage.** *Abstr.* in *Phytopathology* 50 (8, part 1), 1960 (569).

Nursery-grown *Tsuga canadensis*, suffering from a resinous canker causing dieback and ultimately death, recovered within 1 or 2 years after being transplanted from a poorly drained to a well drained site, unless too weakened already, while healthy plants transferred to poorly drained sites developed cankers within a year. Though *Micropera abietina* was found on many cankered trees, neither this nor other organisms isolated from them produced the disease by inoculation, and it is concluded that it is not of parasitic origin.

2180. Giese, R. L. **An insect complex and defoliation associated with Sugar Maple, *Acer saccharum* (Marshall), and the genesis of Maple blight.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (403). O.R.S.

Areas of Wisconsin, in which Maple blight appeared in 1957, had records of epiphytotics of several insects for 3 years immediately before the symptoms appeared. The life stages and the life history of the 3 major defoliating insects, *Sparganothis acerivorana*, *Acleris chalybeana* and *Tetralopha asperatella*, are discussed. Parasites and predators reduced the populations of these insects to enphytotic levels in 1958–59. Experimental defoliation of Sugar Maple and other trees caused tree mortality, terminal dieback, epicormic sprouting and wilting—the clinical symptoms of Maple blight. July–August proved to be the time when the effect was greatest; this is identical with the period of defoliation by the leaf-roller/webworm complex. It is concluded that epiphytotic populations of defoliators in July–August can be expected to result in Maple blight in any stand conditions.

2181. Fraser, D. A., and Dirks, H. T. **Internal water relations of Yellow Birch at Chalk River.** *Canad. J. Bot.* 37 (5), 1959 (789–99). 29 refs. O.R.S.

Wood m.c. was measured in the butt of healthy and decadent *Betula lutea* on various sites in summer 1950 and 1952. The m.c. decreased from almost 100% in May to ca. 60% in late June when the leaves were fully unfolded. It was usually 5–15% higher in decadent than in healthy trees, and was higher on a dry site in a wet summer, and on a wet site in a somewhat dry summer. Relative turgidity in leaves was measured for both mature trees and seedlings on soils with various m.c.'s. Turgidity was usually less during the day; in periods of drought it decreased even at night. In seedlings its value varied between 65 and 50% in soils of 100 to 70% field capacity. As the soil wilting point was approached, turgidity decreased to ca. 35%.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

51. Systems and Units of Measurement (including Conversion Tables)

2182. **Conversion tables for forest research workers.** *Bookl. For. Comm., Lond.* No. 5, 1960. pp. viii + 64. Price 4*s*.

Contains the following main sections: length; area; girth; diameter and b.a. (including, e.g. sq. ft./acre into sq. m./ha.); timber volume; volume (liquid); volume (liquid) per unit area; weight; weight per unit area; weight/volume; speed; miscellaneous; and charts.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

See also No. 1891.

2183. Duff, G. **Methods of measurement and volume calculation for exotic conifers.** *Tech. Pap. N.Z. For. Serv.* No. 29, 1960. pp. 18. 6 refs.

Briefly describes the methods used by the New Zealand Forest Service for log scaling, and measuring d.b.h., height, and volume for single trees, experimental plots, and forests. The chief species are *Pinus radiata*, *P. ponderosa*, *P. nigra* var. *calabrica*, and *Pseudotsuga taxifolia*.

2184. Gieruszyński, T. O zmienności cech taksacyjnych drzew w dojrzałych drzewostanach świerkowych. **[The variability of mensurational characteristics of trees in mature Spruce stands.]** *Folia for. polon.* (*Leśn.*) No. 2, 1960 (5–44). 12 refs. [Pol.russ.g.]

A fuller version of work already noticed [see *F.A.* 18 No. 708], containing all the tabular material.

521. Diameter (Girth) and Sectional Area

See also Nos. 2195–6.

2185. Hellrigl, B. Il cavalletto basimetrico. **[The 'basimetric' caliper.]** *Ital. for. mont.* 15 (4), 1960 (133–8). [It.it.f.]

Describes an instrument designed and constructed by the author, in which the usual scale of diameter in cm. is accompanied by one giving b.a. in the form of sq. m. × 50. This is done in order to facilitate the working of a counter fixed to the right side of the calipers which, by a simple pressure of the operator's thumb, records the total b.a. so far measured. A similar counter on the left side records the total number of stems measured. The construction of the scale and the use of the instrument are described in detail; only one man is needed to carry out the whole operation of enumerating and measuring. [Cf. *F.A.* 21 Nos. 2156–7.]

2186. BRADLEY, R. T. **The value of the optical wedge in forestry management**. *J. Oxf. Univ. For. Soc.* (*5th Ser.*) No. 8, 1960 (6–10). 8 refs.

The objects of this study were: (1) to review and analyse the existing literature; (2) to construct a simple instrument embodying the optical wedge principle; and (3) to attempt to assess the accuracy of estimates of basal area, diameters, and distances, made with this instrument and others of a similar nature.

2187. BLUTEL, Y. Vite, bien, complètement: le Rélascope de Bitterlich le permet-il? **[Quickly, well, completely: does Bitterlich's Relascope make this possible?]** *Rev. for. franç.* 12 (10), 1960 (628–36). [F.]

Gives the results of measurements made by traditional methods on two 1-ha. plots of 92-year Oak, one lightly and one severely thinned, to determine b.a./ha., number of trees/ha., and volume/ha. of stemwood, and compares them with the corresponding values obtained by the use of the angle-count method. The most important conclusion is that, in order to obtain an acceptable degree of accuracy, it is necessary to observe at least 20, and preferably 25, trees in each sweep. This is contrary to claims that have been made (e.g. in the U.S.A. and Finland) that 10–20, or even 4–8 trees per sweep are sufficient. It was found that, even by multiplying the number of sampling points, errors of >10% always occurred when only 10–20 trees were measured, whereas the margin of error with 20–30 never exceeded 5%. The use of a tripod to support the Relascope is strongly recommended. The use of the angle-count method to determine number of trees/ha. and mean and dominant heights, are explained.

2188. SWINFORD, K. R. **Relationships between various measurable stand factors and variation in basal area in Longleaf-Slash Pine flatwoods forests of Alachua County, Florida**. *Abstr. of thesis*, in *Dissert. Abstr.* 21 (2), 1960 (284–5). O.R.S.

Data were obtained by representative random sampling procedures from 41 separate stands in random locations, with a sampling % of 22·2 for all stands. Basic computation and the correlations between variations were calculated on electromechanical computing equipment. Variables found to be significantly correlated with the dependent variable (coefficient of variation (c.v.) in b.a. per plot) were: mean b.a./acre, mean number of trees/acre, c.v. in number of trees per plot, crown closure % (measured from individual plots on vertical aerial photographs), c.v. of crown closure % and % of total diam. classes having ≥10% of the total number of trees. Equations and tables for the prediction of the dependent variable on the basis of the observed single and multiple correlations were developed and their application in determining the number of sample plots for required accuracies in timber cruising is illustrated.

522. Height, Length

See also No. 2200.

2189. HIRATA, T. **[A photographic estimation of stand mean height.]** *J. Jap. For. Soc.* 41 (5), 1959 (178–9). 3 refs. [Jap.]

The use of an ordinary upward-pointed camera, held at a constant height from ground level, to calculate the height of trees is explained. The formula developed from the simple optical system used is discussed, and applied to some actual measurements, with photos, in a stand of Sugi [*Cryptomeria japonica*] near Tokyo. [Cf. *F.A.* 18 No. 4384.]

2190. TAKATA, K. **[On the estimation of mean stand height by Strand's method.]** *J. Jap. For. Soc.* 40 (7), 1958 (305–7). 1 ref. [Jap.]

Strand's method [cf. *F.A.* 21 No. 3521] is compared with those of Hirata [cf. *F.A.* 21 No. 800] and Keibar in a 45-year *Cryptomeria japonica* plantation. Results are discussed.

2191. KREWAZ, J. **Selective versus systematic sampling for height/diameter curves**. *Tech. Note For. Br. Can.* No. 92, 1960. pp. 8. 4 refs.

In order to determine the relative values of systematic and selective sampling for height/diameter curves, use was made of data collected in *Picea mariana* stands, (*a*) by systematic sampling, and (*b*) from a selected sample of dominants and co-dominants. It is concluded that use of data from (*b*) introduces errors of considerable magnitude into the resulting height/diameter curve, and that the application of such a curve, based exclusively on dominants and co-dominants, would result in an underestimate of volume (7·8% for total, and 5·1% for merchantable volume/area). If sufficient systematically sampled data are not available, however, reliable height/diameter curves can be obtained from selected dominants and co-dominants, if a separate curve is prepared for each age or stand-height class.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 2201–3, 2222, 2256.

2192. TAKATA, K. **[Modification of Kunze's stem-curve equation.]** *J. Jap. For. Soc.* 41 (9), 1959 (334–5). 1 ref. [Jap.jap.e.]

The modified equation, in which a substitution is made for the form exponent *r*, was found to be more accurate than Behre's stem-curve equation.

2193. ILIEV, A. Novye metody lesnoj taksacii v Bolgarii. **[New forest mensuration methods in Bulgaria.]** *Lesn. Hoz.* 12 (10), 1960 (85–9). 3 refs. [Russ.]

Summarizing recent Bulgarian work [see *F.A.* 21 Nos. 4732–4].

524.2. Volume of Single Trees

2194. Altherr, E. Die Genauigkeit verschiedener Verfahren der Sektionierung in absoluten und relativen Schaftlängen. **[The accuracy of methods of volume determination by stem sections of absolute or relative lengths.]** *Allg. Forst- u. Jagdztg.* 131 (10), 1960 (226–36). 13 refs. [G.g.e.]

On stem curves derived from sectional measurements of 15,000 Silver Firs, various methods of measurement were compared with that based on 100 sections of equal length, taken as "true volume". By dividing the stem into sections of unequal proportions, accuracy could be increased at little cost. If the basal $\frac{1}{5}$ was divided into 5 equal sections and the top $\frac{1}{5}$ into 2, with the 3 middle fifths not subdivided (10 sections in all) results were much more accurate than for 2-m. sections, or the 5 equal sections used by Hohenadl, and as accurate (ca. 1% error) as 1-m. sections or 25 equal sections.

524.3. Volume of Tree Groups and Stands

See also No. 2186.

2195. Hirata, T. **[Estimation of standing timber through the total volume of elliptic cylinders—another application of vertical angle count sampling (WZP).]** *J. Jap. For. Soc.* 40 (11), 1958 (473–5). 6 refs. [Jap.e.]

Describes a method, developed by the author and based on Bitterlich's "*Winkelzahlprobe*" method [cf. *F.A.* 18 Nos. 4383–4], for estimating the volume of standing timber using a conometer and stand table. The results, though admittedly approximate, are rapidly obtainable in the field.

2196. Hirata, T. **[A statistical application of single tree volume table to the "WZP".]** *J. Jap. For. Soc.* 41 (6), 1959 (209–12). 6 refs. [Jap.e.]

For estimating stand volume (V), the author proposes a method combining the use of the "*Winkelzahlprobe*" [cf. *F.A.* 21 No. 800] with a single-tree volume table, as expressed by the formula:

$$V = N.\phi\ (d,h).\lambda$$

where N is the number of stems/ha., d the mean diameter, h the mean height, and λ (the derivation of which is explained) the correction factor for estimating mean volume per tree. Practical examples of V estimation are given, using this method, which is said to be accurate and far quicker than the conventional one of calculating individual tree volume.

2197. Takata, K. **[On the precision of stand volume equations constructed from different single tree volume equations.]** *J. Jap. For. Soc.* 40 (8), 1958 (366–7). 1 ref. [Jap.]

An interim study. Various stand volume equations, including the author's own equation, are examined and their merits compared.

2198. Takata, K. **[Studies of the volume estimate by basal area at breast height. (11). Strand's method [using a] stand volume table.]** *J. Jap. For. Soc.* 41 (5), 1959 (161–3). 2 refs. [Jap.jap.e.]

Summarizes briefly the findings of a study in which Strand's method of estimating stand volume is compared with those using other common stand volume equations and is found to be more accurate.

2199. Takata, K. **[Studies of the volume estimate by basal area at breast height. (12). Comparisons of stand volume estimating methods by stand volume equations.]** *J. Jap. For. Soc.* 41 (7), 1959 (257–61). 5 refs. [Jap.jap.e.]

Examines briefly the errors of stand-volume estimation using common stand-volume equations, e.g. from sampling errors of independent variables in their equations, and presents findings from comparisons with the more accurate Strand method of stand-volume estimation.

2200. Müller, G. Über die Aufstellung von Tarifen und einer einheitlichen Massentafel für die Fichte aus den mittleren Höhenkurven verschiedener Standortseinheiten. **[The construction of tariffs and of a uniform volume table for Spruce from the mean height curves of various site types.]** *Allg. Forst- u. Jagdztg.* 131 (7; 8), 1960 (159–67; 169–84). 26 refs. [G.g.e.]

Mean curves of height/d.b.h. for groups of stands in the Bavarian Alps showed similar, namely exponential, form, and differences in the constants relating to soil depth, but not to age, exposure or, within wide limits, altitude. Within the d.b.h. range of 16–89 cm. these curves, as also one for Hesse [cf. *F.A.* 21 No. 4740], could all be satisfactorily represented by the formula $D_{1\cdot3} = a \times 2^{\frac{H}{10}}$ where $D_{1\cdot3}$ is d.b.h., a is a site constant and H is total height, and could be plotted on semi-logarithmic paper as parallel lines. These curves were then equated with the stem-form curves of individual trees (ignoring any differences in diameter increment at different heights on the stem), and the volume of the rotational solids enclosed by the curves was computed by integration of the formula. The resulting volume tariffs are represented by straight parallel lines on double logarithmic paper. Artificial and true form factors, having been shown to be a function of height only, are computed for heights from 5 to 40 m., and a standard volume table is presented in graphic form. The volumes theoretically computed from the diameter and height data underlying the volume tables for Hesse agreed with those based on sectional measurement, when a uniform correction factor of 1·074476 was introduced. Similar correspondence over a wide diameter range was also found with Zimmerle's table.

2201. Kirby, C. L. **A taper and volume table and volume formulae for Black Spruce [*Picea mariana*] in Saskatchewan.** *For. Chron.* 36 (3), 1960 (242–51, 277). 7 refs.

2202. Sopp, L. A fekete-dió: *Juglans nigra* L., fatomeg és törzsalak vizsgálatának eredményei. **[Results of investigation into the volume and stem form of *J. nigra*.]** *Erdö* 7 (7), 1958 (262–74). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (8–9). [E.] C.G.B.

A volume table based on 505 trees has been prepared, as Grundner's and Schwappach's Oak tables are only applicable with corrections. The bole has a greater taper than that of Oaks and is most like the Black Locust. Tree class, thinning method, density, and crown dimensions are the dominant factors determining its form.

2203. Sopp, L. Hazai nyárasaink fatömeg- és törzsalak-vizsgálatának eredményei. **[Results of investigations on the volume and stem form of Hungarian Poplar stands.]** *Erdö* 6 (11), 1957 (429–38). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (2), 1958 (9). [E.] C.G.B.

Notes on local volume tables made for *Populus canescens* and *P. alba*, conjointly (2683 stems) and for *P. nigra* (835). Volume of timber down to 7 cm. diam. and total volume are tabulated, and stem, stump, and root %s graphed. Form and volume depend chiefly not on site, but on tree class, thinning, and especially crown dimensions. Other correlations are discussed. Of all native species these Poplars have the worst stem form.

2204. Seth, S. K., and Dabral, S. N. **General standard volume tables for *Casuarina equisetifolia* Forst.** *Indian For. Rec.* (*n.s.*) *Silviculture* 10 (8), 1960 (227–37 + 1 gph.). *Rs.* 2.75 (4*s.* 6*d.*).

Based on measurement of 1911 trees in Bombay, Mysore, and Orissa.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See also Nos. 1311, 2185, 2211.

2205. Josefsson, S. Rationaliseringssynpunkter vid upprättande av skogsbruksplaner. **[Questions of rationalization in connexion with working plans.]** *Svenska SkogsvFören. Tidskr.* 58 (3), 1960 (2*–16*). [Sw.]

Briefly describes the method of the coded recording of data in the field and their processing by punched card, developed in connexion with a valuation survey forming the basis of a consolidation scheme for farm forest holdings and, concurrently, for working plans (more or less simplified) for the new holdings. The methods were also applied in preparing working plans directly, with considerable savings over older methods.

2206. Dixon, R. M. **Inventory maintenance procedure for the province of Ontario.** *Bull.* (*Silv. Ser.*) *Ont. Dep. Lds. For.* No. 1, 1960. pp. 22 + 1 tbl.

Describes in detail, with specimen field record cards, tally sheets, punched cards etc. the system now in use to keep up to date the findings of the survey of forest resources carried out between 1946 and 1959. The inventory is applicable up to a 20-year period, and provides an age-class distribution by 20-year age classes.

2207. Rudolph, V. J. **A field key punch.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (59–60).

A portable, manually operated machine has proved efficient. As tree measurements or characteristics are called out by the cruiser, the key-punch operator punches the data on cards, so that completed cards, ready for tabulation, are produced on the spot.

2208. Findell, V. E. **Chippewa National Forest management plan survey.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (64–73).

Describes a combined continuous forest inventory and management plan survey in Minnesota, using both aerial-photo mapping and ground sample points. Some of the points will be permanently established. Statistics will be computed on either the standard card machines or the IBM '650'. Data on specific forest stands are expected to contribute greatly to the management plan during the next 10-year period.

2209. Jones, T. A. **A complete machine statistical check for a continuous forest inventory.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (88–93).

Demonstrates, with an actual example, a method of carrying out a statistical check on continuous forest inventory data through the use of an electronic computer and associated punched-card processing equipment.

2210. Hartman, G. B., Jr., and Zaidlicz, E. **Tree volume and realization value determination from cruise data by electronic computer in Oregon by the United States Department of the Interior, Bureau of Land Management.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (575–86). 3 refs. O.R.E.

Describes the assessment of volume and value of the timber (mainly Douglas Fir and Ponderosa Pine).

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 1628, 1815, 2187–8, 2191, 2205–10, 2262–7.

2211. **Proceedings, Forest Management Control Conference, Purdue University, February 15, 16, 17, 1960.** Department of Forestry and Conservation, Purdue University, Lafayette, Ind. 1960. pp. 235.

The conference was devoted mainly to techniques of continuous forest inventory (CFI) and the application of data so obtained to management problems in the Central States of the U.S.A. Some of the papers are abstracted separately in this issue of *F.A.* Among the remainder are: Current practices in volume tables (*J. H. Bamping*); Remeasurement with variable periods (*L. B. Winner*) [discusses formulae developed for calculating annual growth and the mean remeasurement period when this varies between plots]; A machine check of area classification (*R. D. Schultz*); Marathon marking tally (*G. N. Semmens*) [notes on machine analysis and comparison of data obtained in forest inventories 21–28 years apart]; Analysis of 100-percent marking tally (*G. Meyer*); Income tax implications of forest inventory (*J. C. Callahan*); A demonstration of linear programming (*R. E. Machol*); Linear programming applied to a wood supply problem (*T. A.*

Jones) [presents a computational method for minimizing costs in a supply system as it actually exists in the pulp and paper industry: the allocation of wood by species, barked and unbarked, to be transported to different pulp mills either by lorry or by rail].

2212. RICHTER, A., and GROSSMANN, H. Ergebnisse der 1956 und 1957 im Gebiet der DDR durchgeführten grossräumigen Holzvorratsinventuren. **[Results of the E. German regional forest surveys of 1956 and 1957.]** *Arch. Forstw.* 9 (8), 1960 (675–713). 15 refs. [G.g.e.russ.]

Reports on a survey covering >2 million ha. with 95,000 circular 4-are plots, representing a mean sampling density of 0·14%. By varying sampling density with size of unit surveyed, the desired accuracy of ±5% (with a 5% probability) was generally achieved on management-unit level (mean size 16,000 ha.) for the national forest, and on the level of 14 (much larger) administrative districts for other forests, in spite of a coefficient of variation of 92% (larger than anticipated). Mean volumes per ha. are given as 120 cu. m. for 1·7 million ha. of national forest and 108 for the 1 million of other forest. A plan and detailed instructions for a sample survey on the Swedish model are presented [cf. *F.A.* 19 No. 768].

2213. PARDÉ, J. Recherches sur l'application aux futaies régulières des inventaires par la méthode statistique. **[Studies on the application of statistical methods of enumeration to even-aged high forest.]** *Ann. Éc. Eaux For., Nancy* 17 (2), 1960 (169–205 + 3 dgms., 13 tbls.). 12 refs. [F.f.e.g.]

Gives data from trial 5% sampling in even-aged Spruce/Fir/Beech forest in the Jura, treated by the uniform system. Explains the necessary analytical methods, and concludes that statistical methods are applicable to French forest inventories. [Cf. *F.A.* 20 No. 3561.]

2214. LAMPRINOS, G. Ektimēsis tou xylōdous onkou systadōn dia kanonikēs leigmatolēpsias dok. epiphaneiōn eis dasos phlampourariou—Ēpeirou. **[Volume estimation of stands by systematic sampling in the Flambourari forest, Ēpeiros.]** *Das. Chron.* 2 (18/19), 1960 (811–8). [Gk.]

A detailed account of the methods used, in pure *Pinus nigra*, 45–100 years, 4390 stremmas. Sampling was by 1-stremma plots, 100–150 m. apart on parallel transects 150–250 m. apart.

2215. MATÉRN, B. **Spatial variation. Stochastic models and their application to some problems in forest surveys and other sampling investigations.** *Medd. SkogsforsknInst., Stockh.* 49 (5), 1960. pp. 144. 134 refs. [E.sw.]

A study originating from the problems treated in an earlier paper [cf. *F.A.* 9 No. 624], discussing, chiefly on the basis of theoretical models, the mathematics of the variance-covariance properties of stationary (i.e. spatially homogeneous) processes in an *n*-dimensional Euclidean space, with special reference to the estimation of accuracy when planning surveys on a finite number of sampling points, and the merits of various methods. In a final chapter, questions arising in connexion with the Third Swedish Forest Survey [cf. *F.A.* 18 No. 3171; 20 No. 2149], which used a system of tract sampling (i.e. sampling along a continuous closed line), are discussed, including size and shape of the tract, distribution of points on it, the effect of methods on cost, etc. [Cf. *F.A.* 21 No. 1310.]

2216. OSBORNE, J. G. **Influence of intended use of forest data on sample plot layout.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (74–81).

2217. KENDALL, R. H., and SAYN-WITTGENSTEIN, L. **A rapid method of laying out circular plots.** *For. Chron.* 36 (3), 1960 (230–3). 1 ref.

Describes a method of laying out such plots by use of the Spiegel Relascope, so effecting a considerable saving of time over the conventional measurement with a tape. The more difficult the cruising conditions, the greater this saving. [Cf. *F.A.* 20 No. 2136.]

2218. ROCK, D. A. **Circular plot establishment on multislope terrain.** *J. For.* 58 (11), 1960 (898–9). 1 ref.

Describes, with an example, a modified and rapid technique that has been used successfully on rough ground or ground sloping in more than one direction at Berea College Forest, Ky. It involves standardized measurements to produce a uniformly circular plot which, upon projection to the horizontal plane, becomes elliptical in shape. The error associated with this technique is small and subject to control. [Cf. *F.A.* 18 No. 734.]

2219. BHALLA, B. K. **Efficiency of enumerations in the Mand Reserve, M[adhya] P[radesh].** *Indian For.* 86 (9), 1960 (531–46).

A total enumeration of 3 sq. miles was made in 1957 in this tropical mixed deciduous forest (Champion's 4a/C 1) in which Teak forms >80% of the crop. Subsequently several types of sampling and sampling units were tested and the results compared with those of the total enumeration. The findings are discussed. There is some indication that, with a rectangular sampling unit, alignment of the longer side in an E.–W. direction is best.

525. Volume by Assortments. Merchantable Volume

See also Nos. 2023, 2025, 2032.

2220. BOJANIN, S. Učešće sortimenata i količine gubitaka kod sječe i izrade jelovih stabala u fitocenozi jele sa rebračom (*Abieto-Blechnetum*). **[The proportion of assortments and the amount of waste in felling and primary conversion of Silver Fir stems in the *Abieto-Blechnetum*.]** *Šum. List* 84 (1/2), 1960 (21–34). 22 refs. [Croat.croat.e.]

Presents assortment tables for Silver Fir (site class II) in the Zalesina forest district, Gorski Kotar, for d.b.h. classes from 22·5 to 72·5 cm. by 5-cm. gradations. The tables are based on measurements of 91 stems.

2221. ČUENKOV, V. S. Tovarnye tablicy dlja listvennicy daurskoj. **[Assortment tables for *Larix***

***gmelinii*.]** *Lesn. Hoz.* 12 (8), 1960 (18–9). [Russ.]

Presents tables for mature (16, 18, 20 . . . 36 cm. mean diam.) and overmature (24, 26, 28 . . . 44 cm. mean diam.) stands in the Amur region.

2222. SCHILLING, O. Die Sortentafel für die Holzart Fichte, hergeleitet nach Schaftkurven für $\lambda = 0{\cdot}550$. **[An assortment table for Spruce, based on stem curves with a form factor $\lambda = 0{\cdot}550$.]** *Allg. Forst- u. Jagdztg.* 131 (9), 1960 (207–13). 17 refs. [G.g.e.]

Presents, in graphic form, an assortment table based on Altherr [cf. *F.A.* 15 No. 2737], showing stemwood class in terms of German sorting rules (based on mid-diameter) for each combination of d.b.h. and stem height, and the % of stemwood and cordwood u.b. in terms of standing volume o.b. Checks with actual results gave good correspondence when slight differences between the mean form-factor for Württemberg used in the table and the mean form factors of the stands in question were taken into account.

2223. FLIGG, D. M., and BREADON, R. E. **Log position volume tables.** *For. Surv. Note B.C. For. Serv.* No. 4, 1959. pp. [120].

The purpose of the tables (separately for *Pseudotsuga taxifolia*, *Thuja plicata*, *Tsuga heterophylla*, *Picea sitchensis*, and *Abies lasiocarpa*) is twofold: (1) to provide regionally applicable information on the average cu. ft. volume in 32-ft. logs, according to their position in trees of varying species, d.b.h.o.b., and total height; (2) to indicate possible log grade, according to size requirements only, for each log position in trees of varying species, d.b.h.o.b., and total height. The tables are bound in loose-leaf form.

2224. DALE, J. E. **A simplified method of computing cordwood volumes in the woods.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (551–8). 1 ref. O.R.E.

The method is based on the observation that b.a. at b.h. is roughly (2 in. + 3 in. + 4 in. + . . . + d.b.h.)/100. This summation factor can be used to find the cordwood content of any tree: number of cords = (summation factor × total height in ft. × 5)/1000. Volumes as computed by the author's summation method are tabulated against actuals for a number of conifers and hardwoods native to the eastern U.S.A. Volumes calculated by summation are considered sufficiently accurate to justify their use in rough field approximations.

2225. VINCENT, A. J. **A study of the merchantable yield per acre from final fellings in inland forest—Malaya.** *Res. Pamphl. For. Res. Inst., Kepong* No. 30, 1960. pp. 145 + map.

At the State Forest Officers' Conference in June 1950 the figure of 10 tons/acre (equivalent to 500 Hoppus feet, some 550 cu. ft. Malayan measure or, say, 635 cu. ft. true) was provisionally accepted as the average outturn of round timber from virgin jungle. Subsequently, by the random siting of rectangular one-acre outturn plots in areas of inland forest undergoing final felling, an attempt was made to revise or confirm this figure. In all, 83 plots were available for analysis by 1959, scattered over a variety of known or suspected forest types, but only 40 of these gave utilizable figures on outturn. Consequently more confidence was placed on a figure for outturn derived from supplementary data for compartments as a whole, giving 15 tons/acre (equivalent to 750 cu. ft. Malayan measure, or some 860 cu. ft. true). Much additional information has been culled from the plots and this is given with comparative data to hand, with a statement on its reliability and a list of recommendations on how such information could be used in the Department. The individual plot stand tables have also been gathered together as an appendix for further reference. *From author's summary.*

2226. MYERS, C. A. **Estimating oven-dry weight of pulpwood in standing Ponderosa Pine.** *J. For.* 58 (11), 1960 (889–91). 13 refs.

From 68 Ponderosa Pine, selected at random throughout the Black Hills, S. Dakota, from 19 plots in stands ready for pulpwood thinning, oven-dry (o.d.) weights of their merchantable boles were calculated from air-dry weights by using moisture contents determined with a moisture meter. These weights were correlated with several readily observed tree and stand characteristics to test the accuracy and practicality of cruising trees by weight. It was found that o.d. weights of the merchantable boles and their cu. ft. volumes were closely correlated. Regression times for thinned and unthinned stands did not differ significantly. To compute pulpwood weight from cruise data, plot cu.-ft. volumes can be multiplied by 24·8, the number of pounds per cu. ft. [cf. *F.A.* 21 No. 2186]. Alternatively, weight can be computed direct from measured diameters and merchantable lengths and a logarithmic tree-weight equation: $W = 1{\cdot}46847\ D + 1{\cdot}04867\ H - 0{\cdot}74002$ where W = logarithm of o.d. weight of the merchantable bole in pounds, D = log. of d.b.h. in inches, and H = log. of merchantable length in feet. The multiple correlation coefficient was 0·988. Either procedure gives the total weight of a number of trees; the weight of an individual tree may differ from the mean of its size class.

526. Log Measurement. Scaling

See Nos. 2226, 2227–9.

527. Solid Volume of Stacked Products (including Converting Factors)

See also Nos. 2224, 2226.

2227. SUTTON, G. **Data sheet A—1. Weight of wood per cord.** *Pulp·Paper Mag. Can.* 61 (10), 1960 (466). 3 refs.

Shows in a graph the relation of oven-dry weight per cord to sp. gr. and to the volume of solid wood per cord.

2228. NISULA, P. Paino pinotavaran ja hakkeen mittana. **[Weight as a standard for stacked wood and chips.]** *Pap. ja Puu* 42 (10), 1960 (523–34). 36 refs. [Fi.fi.e.] P.R.

[Cf. *F.A.* 20 No. 4989; 21 No. 2185.] Surveys the literature on methods of measuring weight and on data and experience of the reliability of weight as a standard. Discusses types of scales [illustrated] used in Finland for weighing wood. *From author's summary.*

2229. GRIPENBERG, N. B. Kilogram som redovisningsenhet vid virkesköp. **[Kilograms as accounting units for wood.]** *Skogen* 47 (20), 1960 (370–1). [Sw.]

In an agreement for the purchase of unbarked Birch pulpwood, believed to be the first of its kind concluded by a Swedish pulp mill, only one price was fixed for any forestry year, irrespective of quality and season. An exploratory study had shown a strong correlation to exist between green density and basic density, and, despite variations in m.c. due to felling season and storage, weight to be more accurate in terms of fibre output than stacked measure [cf. *F.A.* 20 No. 2157]. A lowering of acceptance standards for size, crookedness and rot made possible by this method should increase merchantable output considerably.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 1599, 1830, 2258, 2646.

2230. SARMA, P. Attiecības starp audzes biezību, vainagu slēgumu un koku skaitu. **[The interrelations between density of stocking, crown closure, and the number of trees in the stand.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 14, 1958 (251–9). 11 refs. [Latv.russ.] N.L.L.

Briefly reviews literature and the distinction to be drawn between (*a*) "canopy closure" (cover vs. open sky) and (*b*) "crown closure" (summation of the individual crown projections); (*a*) is always <1, and (*b*) is sometimes greater than (*a*), especially in young stands, while in old stands the values of (*a*) and (*b*) converge. The number of trees per unit area is, unless supplemented by other data, of less importance than the mean distance between trees [cf. *F.A.* 14 No. 1401]. Density of stocking defined by b.a. must be distinguished from that defined by standing volume or by (*a*). However, (*a*) can be used as an aid in estimating density of stocking by eye.

2231. CHANDLER, C. C. **Slash weight tables for westside mixed conifers.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 48, 1960. pp. 21. 7 refs.

The tables, for differing crown lengths (as % of total tree height), cover Ponderosa Pine, Sugar Pine, Douglas Fir, White Fir and Incense Cedar in California, showing dry weight of slash per tree and per 1000 bd. ft. for trees of 12–60 in. diam. Additional tables give dry weight of cull and of small diam. trees.

54. Assessment of Site Quality

See also Nos. 1315–6, 1522, 1526, 1611, 1678.

2232. BAJZAK, D. **An evaluation of site quality from aerial photographs of the University of British Columbia Research Forest, Haney, B.C.** *For. Chron.* 36 (2), 1960 (171).

Estimation of site index from aerial photos (using the following topographic features—aspect, % slope, shape in profile, and shape in contour) were found to be much more accurate than computed equations based on soil data derived from sample plots (soil depth, moisture regime, permeability, soil texture etc.).

2233. DEAN, H. C., and CASE, J. M. **Soil survey interpretations for woodland conservation. Forested coastal plain, Arkansas, progress report.** Soil Conservation Service, U.S. Department of Agriculture, Little Rock, Ark. 1959. pp. [ii] + 54. 15 refs.

Presents mean site indices for Shortleaf and Loblolly Pines for 67 soil types, and, for 9 groups of soil types, their suitability for tree crops in terms of site index, degree of plant competition, limitations of equipment, seedling mortality, windthrow and erosion hazards, a nomogram for their economic evaluation, etc.

2234. ROW, C. **Soil-site relations of old-field Slash Pine plantations in Carolina sandhills.** *J. For.* 58 (9), 1960 (704–7). 7 refs.

Statistical analysis of data from 127 plots showed that heights of Slash Pine plantations can be estimated from their age and two soil variables: depth to a fine-textured horizon, and thickness of the A_1 horizon. An equation and graph are given from which 25-year site indices for prospective planting areas can be estimated by inserting values for these variables. [Cf. *F.A.* 17 No. 1850; 21 No. 3579.]

2235. BEERS, T. W. **An evaluation of site index for mixed Oak in the central hardwood region** [U.S.A.]. *Abstr. of thesis*, in *Dissert. Abstr.* 21 (1), 1960 (11–2). O.R.S.

The standard site index, based on tree height and tree age, and an index based on total tree height and d.b.h. were derived from data from established stands of mixed Oak species of comparatively uneven-aged structure, and were compared with actual productivity data from permanent increment plots. The relation of stand density to the indexes and to periodic growth was also studied. The relation of tree height to diam. for all species grouped together (no species differences being significant) was linear, probably largely because of the selected nature of the sample. Plot site-index values derived from the relationship, although significantly correlated with plot growth, failed to account for part of the growth variation, and the same was true of index values derived from the curvilinear relation of tree height to age. Both indexes were considerably affected by stand density, but a linear adjustment removing the effect of density reduced the correlation of site index with growth. Although neither site index was satisfactory, that based on height and d.b.h. is preferable because of the simplicity of field application. It was concluded that a direct classification based on a growth regression might prove a suitable alternative to the site-index method of classifying productivity. An empirical equation was derived using (1) the number of trees >4 in. d.b.h., (2) their basal area, and (3) the number of ingrowth trees [recruits]; these characteristics are easily determined and account for $>80\%$ of the variation in growth (gross growth including ingrowth).

2236. Vincent, A. J. **Is there a significant difference in average total height between trees of *Shorea leprosula* Miq. growing in virgin lowland Dipterocarp forest over different geological strata?** *Malay. Forester* 23 (3), 1960 (221–9).

Analysis of data collected for volume tables showed that differences due to differences in topography were at least as great as, and effectively masked, differences due to the geological formation. Any comparison between geological strata must be preceded by classification of lowland Dipterocarp forest into hill and flattish-land forest.

2237. Moosmayer, H.-U. Standort, Waldgesellschaft und Ertragsleistung. **[Site, forest community and yield.]** *Allg. Forstzeitschr.* 15 (43), 1960 (613–6). 19 refs. [G.]

A lecture comparing, chiefly on the basis of published research in Württemberg [cf. *F.A.* 18 Nos. 4425–8; 19 No. 4634], the height and volume development of Spruce and Beech on similar soils, in areas of different regional forest communities [cf. *F.A.* 21 No. 4193], on different soils in the same area, and, for Spruce, on sites differing in ground vegetation though similar in soil type, or differing in soil type, though similar in ground vegetation.

55. Age Determination

2238. Šanin, S. S., and Falaleev, Ė. N. Zakonomernosti vozrastnogo stroenija hvojnyh lesov Sibiri. **[Age-structure patterns in the conifer forests of Siberia.]** *Lesn. Hoz.* 12 (10), 1960 (20–1). [Russ.]

Shows, in graphs and tables, stem distribution by age classes (20, 40, 60 . . . ⩾200 years) in *Pinus sylvestris*, *Larix* [unspecified], *Picea* [*obovata*], *Abies* [*sibirica*], and *Pinus sibirica* forests.

56. Increment. Development and Structure of Stands

See also Nos. 1494, 1602, 1646, 1656, 1678 *et seq.*, 1831 *et seq.*, 1855, 1885.

2239. Radonjić, M. O jednoj Hossfeld-ovoj funkciji rastenja. **[A Hossfeld growth function.]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 12, 1958/1959 (1959), (263–76). 11 refs. [Serb. g.*g*.]

A mathematical discussion of a function published by Hossfeld in 1822, which was tested against data for 5 site classes from Guttenberg's yield tables for *Picea abies*. The results were superior to those obtained when further formulae by Levaković, Mitscherlich and Hossfeld were tested for comparison. [Cf. *F.A.* 19 No. 2141.]

2240. Cormack, R. M. **Partitioning the "between slopes" sum of squares for forest growth data.** *Biometrics, Tallahassee, Fla.* 16 (1), 1960 (121–4). L.S.

Describes (in answer to an enquiry) a method of analysis of data from a study of height and diameter growth of Spruce grown at 4 different spacings, to elucidate the change in pattern (increase in the sums of squares of x = diam. and decrease in the sums of squares of y = height growth) with increasing spacing. [No growth or other test data are given.]

2241. Pearce, S. C. **A method of studying manner of growth.** *Biometrics, Tallahassee, Fla.* 16 (1), 1960 (1–6). L.S.

Discusses a mathematical model based on data from a fertilizer trial with Apple trees. The relationship between such quantities as the standard error of log. (size) and the mean increment of log. (size) is shown to be able sometimes to suggest a law of growth, such as relationships between growth rates and initial size, changes in growth rates, etc.

2242. Erteld, W. Bericht über das in der Zeit vom 21.bis 28.9.1959 in Eberswalde abgehaltene Ertragskundliche Symposium. **[Report on the yield-studies symposium at Eberswalde, 21–28 Sept. 1959.]** *Arch. Forstw.* 9 (4), 1960 (305–25). [G.]

Summaries of 14 papers (with discussions) including: The use of temporary sample plots to determine optimum b.a. (*Trampler*) [formulae for Spruce and Pine based on the relations: b.a./mean-height, and height-increment/volume-increment]; Finding stem p.a.i. by the method of increment form factors (*Sirakoff* [*Sirakov*]) [based on form-factor changes of sample trees]; Growing *Picea sitchensis* and *Pinus strobus* in East Germany (*Lembke*) [results on various sites]; and Mensurational studies on Poplar stems (*Knapp*) [data on taper, total volume, stem volume etc. based on ca. 2000 stems of 6 varieties or species].

2243. Hildebrandt, G. Vorratsstruktur und Zuwachsleistung im Bauernplenterwald Schapbach (Schwarzwald). **[Growing-stock structure and increment in the farm selection forest of Schapbach (Black Forest).]** *Allg. Forst- u. Jagdztg.* 131 (8), 1960 (169–76). 17 refs. [G.e.]

Gives data on stem, diameter, and increment distribution over diameter classes on 3 plots in typical farm selection forest of Silver Fir with Spruce. In (1), with a growing stock of 458 cu. m./ha. and a nearly ideal diameter distribution curve, c.a.i. was 11 cu. m./ha.; in (2), which was in process of building up, with a growing stock of 330 cu. m. and a deficiency of large stems, c.a.i. was 10·2; in (3), an over-dense stand (668 cu. m.) with an excess of large stems (an example of timber "hoarding"), c.a.i. was 7·8. Spruce preponderated in regeneration <1 m. high in plots (2) and (3), presumably because of game browsing, and in (2) even in the larger young growth.

2244. Petri, H. Ein weiterer Beitrag zum Fichtenwachstum im nördlichen Rheinland-Pfalz. **[A further report on the growth of Spruce in N. Rheinland-Pfalz.]** *Forstwiss. Cbl.* 79 (7/8), 1960 (237–53). 8 refs. [G.g.]

In addition to the plots already studied [see *F.A.* 20 No. 870], another 65 dense stands, unthinned for many years, were measured. Results confirmed those of the previous study.

2245. Gieruszyński, T. Struktura i zmienność przyrostów drzew w dojrzałych drzewostanach świerkowych. **[Structure and variability of tree increments in mature Spruce stands.]** *Folia for. polon.* (*Leśn.*) No. 2, 1960 (45–99). 5 refs. [Pol.russ.g.]

A fuller version of work already noticed [see *F.A.* 18 No. 757], containing all the tabular material.

2246. Žanet, V. A. Formirovanie el′nikov na koncentrirovannyh vyrubkah v podzone južnoj tajgi. **[Formation of Spruce stands on concentrated fellings in the S. taiga subzone.]** *Soobšč. Lab. Lesoved., Moskva* No. 2, 1960 (23–36). 10 refs. [Russ.]

Studies were made in the Kostroma region, in the *Piceetum tiliosum* (1) and *P. myrtillosum* (2), after main fellings. In all, 43 observation plots were established in stands from 5 to 110 years old; 225 sample trees were used for growth analysis, of which 105 were stem-analysed. In both (1) and (2), clear felling led to succession by hardwoods. The formation of the Spruce storey in (1) generally ended after 15 years, and after 10 in (2). The max. number of stems was found in 5-year stands in (1) and in 8-year stands in (2). Mass mortality in the hardwood canopy occurred at ca. 70 years in both (1) and (2), but hardwoods still exceeded the number of Spruce up to the age of 80. Strong Spruce height increment began at ca. 50 in (1) and ca. 60 in (2), and at ca. 80 years the hardwoods were only 2 m. taller than the Spruce. In both (1) and (2), mean stem diameter was greater for hardwoods than for Spruce, the difference diminishing with age, down to 1–5% in mature stands. The culmination of diam. m.a.i. in (1) is at 55 years for Spruce, and at 45 for Birch; in (2), at 60 and 70 years respectively. Hardwood b.a. is greater than Spruce b.a. up to 80 years in both (1) and (2). Hardwood volume exceeds Spruce volume up to 80 years in (1) and up to 90 in (2). Spruce becomes dominant because of hardwood mortality; at 90 years, the number of hardwood stems has diminished to only some 1% of their maximum number.

2247. Erteld, W. Untersuchung über Leistung und Entwicklung der Kiefer bei verschiedener Behandlung. **[Yield and development of Pine under various treatments.]** *Arch. Forstw.* 9 (4), 1960 (326–64). 10 refs. [G.g.e.russ.]

Re-analysis of E. German sample plots led to some modification of Wiedemann's conclusions [cf. *F.A.* 13 No. 1995] that volume increment was largely independent of b.a. In older stands, volume increment increased with b.a. In younger stands, definite, if small, stimulating effects of thinning could be seen, and optimum b.a.'s could be determined, but these optima lay close to the table values for moderate thinning, with 21–23 sq. m. rising to 24–25 sq. m./ha. at age 50, for the poorer, and 31–32 sq. m. rising to 35–37 sq. m. at age 35–40 for the better sites. The effect of thinning intensity on diameter development and the fate of trees with different growth patterns were investigated. The two main types [cf. *F.A.* 19 No. 1574] could still be recognized by their crown habit at ages >100.

2248. Bozděch, J. Porovnání výnosnosti lesa stejnověkého s lesem výběrným. **[Comparison of the yield of even-aged forest and selection forest.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (259–75). 30 refs. [Cz.russ.g.]

Compares individual tree growth, volume production, c.a.i., assortment structure, and wood quality from even-aged and selection forest, using data from classical Central European sources of literature.

2249. Colette, L. Trente années de contrôle en hêtraie jardinée. **[Thirty years of management in Beech selection forest.]** *Trav. Sta. Tech. Groenendaal (Sér. B)* No. 25, 1960. pp. 44. 13 refs. [F.]

A detailed account of recruitment, changes in growing stock, changes in girth classes, and increment in a Beech forest in the Ardennes.

2250. Mezera, A. Produkční schopnost stupňů dřevin jihomoravského lužního lesa a representativnost srovnávacích ploch podle růstu a přírůstu dřevin. **[Increment of tree species of the S. Moravian flood-plain forests, and the representativeness of comparative plots as regards the development and increment of trees.]** *Sborn. věd. Prací Fak. Lesn. Čes. Vysoké Učení Tech.* No. 2, 1959 (115–46). [Cz.russ.g.] [A paper similar to *F.A.* 21 No. 1596.]

2251. Joachim, H. F. Untersuchungen in Reihenpflanzungen der Pappel. **[Investigations in single-row planting of Poplars.]** *Arch. Forstw.* 9 (3), 1960 (201–58). 34 refs. [G.g.russ.e.]

Reports on studies made in 1955–57 in Mecklenburg, Brandenburg and Saxony; 2831 trees along 22 km. of row or avenue were measured. *P.* × *robusta* (1136 stems), *P.* × *serotina* (710), *P.* × *marilandica* (407), *P.* × *berolinensis* (212) and the "Spreewaldpappel" (148) [cf. *F.A.* 16 No. 2727] were the chief of the 10 varieties concerned. A 20-tree sample sufficed for diam. variation at the 7% level of significance. Diameter range in any row was small, site and spacing being the chief causes of variation. Stem excentricity showed variation with cultivar and there was a correlation (also varying with cultivar) of crown with stem diameter. For a single site and clone row, height growth was very uniform. For short and medium rotations, 5-m. spacing gave better yields than 10-m. Yields, though similar to those of other districts, showed basic differences from Schmitz-Lender and Blume figures [see *F.A.* 13 No. 118]. Growth was very closely linked with site. In avenues, better growth was shown in the southerly rows. In bottomlands, pole-size setts (e.g. from pollard shoots of the "Spreewaldpappel") were successful. The yield of agricultural crops in the zone of competition is depressed [cf. *F.A.* 17 No. 1588] but this and the yield of timber can be economically influenced by fertilizing. An approximate yield table, unclassified for site or spacing, is given, indicating yields per km. of row. Various Poplar ordinances for non-forest land, going back 400 years, are quoted.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

2252. Kuroiwa, K. **Measurement of radial change of stems by strain gauge.** *J. Jap. For. Soc.* 41 (9), 1959 (331–3). 3 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 17 No. 3124; 19 No. 803.] Simultaneous hourly readings were made by strain gauge and mirror dendrometer of the radial changes in a young Pine, a close similarity being observed in the curves plotted. Despite a smaller magnification, the strain gauge is said to offer advantages of greater stability in wind, etc., and ease of operation in remote sites by automatic means. Its attachment to the stem is illustrated.

2253. Bowers, N. A. **Research completed on power-driven tools for taking long core-borings.** *Tree-Ring Bull.* 23 (1/4), 1960 (10–3).

Describes an instrument developed at the Tree-Ring Laboratory, Atherton, Calif., that will take a 6-ft. core. [Cf. *F.A.* 22 No. 900.]

2254. Schove, D. J. **Cross-dating of Anglo-Saxon timbers at Old Windsor and Southampton.** *Medieval Archaeology, London* 3, 1959 (288–90). 2 refs.

[See *F.A.* 20 No. 3590.] Although the two floating chronologies established separately by tree-ring analysis of old Oak timbers from (*a*) Old Windsor and (*b*) Southampton (Hamwiḥ site) were previously thought to match closely over a 70-year period, recently excavated archaeological evidence at (*a*) was not consistent with a 10th-century dating. The absolute dates of ca. 960 for (*a*), and ca. 840 for (*b*), timbers, must now be abandoned, the tree-ring evidence being valid only to indicate a 120-year lapse between felling dates. No satisfactory correspondence was found between (*a*) tree-rings and those known to be of the 10th century at Westminster, and the basis on which the provisional (*b*) dating was constructed (i.e. the 764 tree-ring and a coin of ca. 840) was also found to be insecure.

2255. Yamahata, K., and Masuoka, K. **[Studies on the method of analysis of tree growth (1). Measurement of area for the eccentric disk.]** *J. Jap. For. Soc.* 41 (3), 1959 (93–7). 9 refs. [Jap.jap.e.*e.*]

Describes tests to compare a new method of analysing tree growth with 8 conventional methods of stem analysis. Detailed results of the tests (using 70 excentric disks of *Pinus densiflora* and *P. thunbergii*) are tabulated.

2256. Vuokila, Y. Männyn runkomuodon kehityksestä. **[The development of the stem form of Scots Pine.]** *Metsät. Aikak.* 1960 (9), (306–8). [Fi.e.*e.*]

Presents tabulated data of diam. growth measured at different fixed heights [0–24 m.] on stems [at 5-year intervals from 10 to 80 years old] in Scots Pine stands thinned heavily from below. In young stems, diam. growth at higher points in the stem may be 2–3 times that at breast height. It is concluded that, in growth calculations, the stability of stem form (expressed as the difference in cm. between d.b.h. and diam. at 6 m. according to local volume tables) can be accepted for stands ≮40–50 years old but that in young stands considerable errors result from any assumption of stability. *From author's summary.*

2257. Kosonogov, P. Tekući prirast i način njegovog određivanja. **[Current increment and its determination.]** *Šumarstvo* 13 (1/2), 1960 (35–48). 4 refs. [Serb.f.]

A mathematical examination, criticizing in detail formulae for calculating c.a.i. % based on the increment over a long period, and developing a formula similar in appearance to that of Leibnitz but substituting x (the time taken for the diameter to increase by 1 cm., i.e. from d to $d + 1$) for n (a constant period of 10 or 20 years). Tables giving values for 'x' and 'm' (= volume) are described elsewhere [cf. *F.A.* 20 No. 5022]. The importance of this method is illustrated by the fact that values for c.a.i. % obtained by it and by other formulae (those of Pressler, Kunze, Todorović, Levaković, and Leibnitz are compared for given stem diameters) may differ by >70%. [Cf. *F.A.* 13 No. 4106.]

2258. Anučin, N. P. Opredelenie tekuščego prirosta nasaždenij po bokovoj poverhnosti derev'ev. **[Determining the current increment of stands by the lateral [cambial] surface area of the trees.]** In *Voprosy lesovedenija i lesovodstva.* Moscow. 1960. pp. 346–61. [Russ.E.]

Describes a method developed by the author, in which c.a.i. is determined from the mean width of the annual rings and the total cambial area (i.e. stem surface area u.b.) in the stand [cf. *F.A.* 13 No. 530; 16 No. 3003]. This cambial area is calculated from Vargas-de-Bedemar's tables for Pine stands of all ages and site classes in the Leningrad area, from which it appears that, after the age of 40–50 years, a stand's cambial area remains virtually constant. This area multiplied by the mean width of the last 10 annual rings (obtained by increment borer) gives the volume c.a.i. Mortality in Pine stands of all classes and ages in the area is calculated from yield tables, and formulae presented for determining actual volume increment. A nomogram is constructed showing c.a.i. for Pine stands of all site classes, densities, and rates of diameter increment (width of last 10 rings). The details are also given (with drawings) of an "increment probe" which is used instead of the Pressler borer to take increment cores; it is hammered, not screwed, into the tree.

562. Volume Increment

See also Nos. 2257–8.

2259. Losickij, K. B. Opredelenie veličiny tekuščego prirosta v lesah SSSR. **[Determining current [volume] increment in the forests of the U.S.S.R.]** *Lesn. Hoz.* 12 (4), 1960 (7–10). [Russ.]

Proposes using the relation between c.a.i. and m.a.i. (in %), which can be determined from stand yield tables, preferably local. This is demonstrated for Spruce of various site classes in closed stands, using A. V. Tjurin's tables, and with a medium thinning grade using Gerhardt's; also for Oak (Wimmenauer's), and Scots Pine provenance trial stands (Vargas', Levin's, Tjurin's).

566. Yield Tables and Their Construction

2260. Czarnowski, M. S., and Burns, P. Y. **Yield table for fully stocked Loblolly Pine stands in Louisiana.** *LSU For. Note La. Agric. Exp. Sta.* No. 38, 1960. pp. 4. 3 refs.

Presents, for six site classes and ages 20 to 80 years, total volume in cu. ft., volume of wood 4·5–6·5 in. d.b.h. in cords, and volume of wood ⩾6·6 in. d.b.h. in bd. ft. A graph and table relate the new "site indicator" used, representing the normal stem number on an area equal to the square of mean stand height, to conventional site indices, age, height, etc. The tables and curves were developed from N. and Central Louisiana data with the help of 4 equations based on a theoretical analysis of stand growth.

58. Surveying and Mapping. Aerial Survey

See also Nos. 1891, 2086, 2142–3, 2232.

2261. SOKOLOVA, N. I. Primenenie kolesnogo avtomata dlja opredelenija rel′efa zemel′ sel′skohozjajstvennogo naznačenija i lesnyh massivov. **[The use of an automatic surveying level mounted on a bicycle, for determining the relief of agricultural and forest land.]** *Izv. Timirjaz. Sel′.-hoz. Akad., Moskva* No. 4, 1960 (227–31). 2 refs. [Russ.e.] O.W.

Describes the instrument (designed by Artanov) which records automatically the relief of the ground over which it is moved, and tests on it which indicated its suitability for agricultural and forest surveying.

2262. KUUSELA, K., and SETÄLA, K. Koe metsikköarviointien suorittamiseksi kelikopterista. **[A trial of visual estimation of tree stands from a helicopter.]** *Silva fenn.* 97 (3), 1959. pp. 24. 35 refs. [Fi.e.*e*.]

The trial was made in connexion with the mapping and enumeration of the forest district of Inari, lying 300 km. north of the Arctic Circle and consisting of old, pure stands of Pine with a small admixture of Spruce and Birch, and open mountain and swamps. The helicopter, a Bell 47D, was used for 7 hours in checking the photo-interpretations made on contact prints taken by a wide-angle camera on a scale of 1 : 40,000, and estimating site type, tree species, dominant height, density, age, volume, development stage etc. of the stands. The estimates were dictated into a Minofon recorder and ca. 25% of them were checked on the ground. Though deviations between the two methods were quite large, average volume for the whole area was the same in both. The use of the helicopter saved 45% of costs compared with a field check. It is concluded that estimates made by visual reconnaissance from a helicopter are valuable in large, roadless areas and for rapid inventories. *From authors' summary.*

2263. SAVENKOV, P. F. Aėrotaksacija lesa s vertoleta MI-1. **[Forest inventory with the MI-1 helicopter.]** *Lesn. Hoz.* 12 (7), 1960 (11–3). [Russ.]

An account of inventory work from aerial photographs taken on two flight runs, (*a*) 250 m. alt., 60 km./hr., (*b*) 100 m. alt., 40 km./hr., by an MI-1 helicopter, and of its accuracy compared with that of ground work. The quality of the work can be improved by flying over the area twice, photographing at 250 m. for stand composition and density, and at 100 m. for age and site class. It is also recommended that the same man carry out all stages of the work, starting with the ground work and finishing with the aerial work.

2264. SPURR, S. H. **Photogrammetry and photo-interpretation. With a section on applications to forestry.** The Ronald Press Company, New York. 1960. pp. vi + 472. Many refs. Price £4. 16*s*.

A second, completely revised edition of "Aerial photographs in forestry" [cf. *F.A.* 10 No. 2336] in 5 parts: Aerial photographs, Photogrammetry, Mapping, Photo-interpretation, and Forestry applications (uses of aerial photographs in forestry, measurements of trees and stands, estimation of diameter and volume, aerial photographic forest surveys, uses in controlling ground inventory, uses in forest measurement).

2265. BEREZIN, A. M., and HARIN, N. G. Krupnomasštabnuju aerofotos″emku—v proizvodstvo. **[Large-scale aerial photographs are of practical use in forestry.]** *Lesn. Hoz.* 12 (5), 1960 (15–8). 1 ref. [Russ.]

Discusses the determination of number of trees, stand composition, mean height and diameter, and stand density from large-scale aerial photographs.

2266. ALISON, G. W., and BREADON, R. E. **Timber volume estimates from aerial photographs.** *For. Surv. Note B.C. For. Serv.* No. 5, 1960. pp. 25 + 1 photo.

A method of obtaining 'cheap' volume estimates is described in detail. The main saving comes from the replacement of a large proportion of the field work by office work to obtain a volume estimate of required reliability. This is particularly important in areas difficult to sample on the ground because of inaccessibility, adverse terrain, or time of year. In the example given, 6 ground samples and 74 photo samples (together representing ca. 20 man-days) were shown to be equivalent to 32 ground samples alone (ca. 65 man-days exclusive of travelling time), thus effecting a saving of ca. 50 man-days or at least $1800.00.

2267. WOLFF, G. Zur Verbesserung der Methodik von Holzvorratsinventuren mit Hilfe des Luftbildes. **[Improving volume inventory methods with the aid of aerial photos.]** *Arch. Forstw.* 9 (4), 1960 (365–80). 13 refs. [G.g.russ.e.]

Computes, on models, the gains in accuracy and cost made possible by varying sampling densities in sample surveys by means of stratification. Computations based on actual sample-plot data from a Pine, a Pine/Beech, a Beech, and a flood-plain forest region, grouped by various criteria, suggest that best results would be achieved with a limited number of strata based on a combination of stand height and canopy density, and clearly distinguishable on aerial photos.

2268. BURINGH, P. **The development of methods of aerial photo-interpretation in the soil section of the International Training Centre for Aerial Survey.** *Publ. Int. Training Cent. Aerial Surv., Delft* No. 2*B*, 1960. pp. 16. 50 refs. [E.]

2269. BOON, D. A. **Results of forest type mapping in Switzerland.** *Publ. Int. Training Cent. Aerial Surv., Delft* No. 4*B*, 1960. pp. 18. 2 refs. [E.e.]

Describes forest-type mapping on aerial photographs of the community forests belonging to the city of Berne. Photo-interpretation, checking and map construction are covered. Special attention is given to the % of errors in interpretation and their possible causes, and a comparison is made of time taken by photo-interpretation and conventional ground-survey methods (a saving of 50% in time by the former).

2270. MOESSNER, K. E. **Estimating the area in logging roads by dot sampling on aerial photos.** *Res. Note Intermt. For. Range Exp. Sta.* No. 77, 1960. pp. 4.

The study reported here was made in order to determine: (1) whether the area in roads, skid trails and landings visible on aerial photos of recent logging operations could be effectively measured by dot sampling (*a*); (2) how the area so computed would compare with areas measured on the ground (*b*); and (3) the comparative costs of the two methods. It was found that (*a*) gave rather larger (but possibly more correct) values than (*b*); it was found possible by dot sampling to measure variations in road width due to bank slopes, fills, turns, and road junctions, that are almost impossible to measure by ground techniques. Time taken to measure comparable samples by (*a*) was ca. 2 man-hours and by (*b*) 2–3 man-days, and the cost of (*a*) would be ca. 10% of the cost of (*b*).

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 1502, 1506, 1642, 1647, 1676, 2211.

2271. KUUSELA, K. **Management and cutting budget problems in the Himalayan conifer forestry.** *Acta for. fenn.* 67 (8), 1958 (1959). pp. 42. 42 refs. [E.e.fi.]

[Part of a final report to the Indian Government under the terms of an agreement between Finland and India on technical assistance to India.] A critical examination of past and present methods in relation to India's expanding economy, and recommendations for greatly increasing yields, based on shorter rotations and max. volume yield/acre.

62. Methods of Management. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 1502, 1628, 1828, 2205, 2211, 2280, 2435.

2272. PENISTAN, M. J. **Transforming plantations to forests.** *Scot. For.* 14 (4), 1960 (185–98).

In 1956 and later, visits were made to those N.W. European countries having extensive conifer plantations. This article describes their present condition, and the steps taken by European foresters to safeguard and sustain their yield. It suggests briefly the lines that British practice should follow to secure sustained yield.

2273. TOMAC, Z. Razmatranja o određivanju etata u prebornim šumama (prethodna obavještenja). **[The determination of yield in selection forests (preliminary report).]** *Šumarstvo* 13 (1/2), 1960 (57–64). 5 refs. [Serb.f.]

Develops formulae for calculating felling intensity (expressed as % volume to be removed in felling cycle) and yield in selection forest, using a mixed Beech/Silver Fir stand as an example. [Cf. *F.A.* 15 No. 2775.]

64. Forestry as a Business: General

See also No. 1857.

2274. **Financial management of large forest ownerships.** *Bull. Yale Sch. For.* No. 66, 1960. pp. 124 + 1 dgm.

Includes the following papers: Capital budgeting for acquisition and development of timberlands (*J. Fedkiw*); Factors which attract equity and borrowed capital to timberlands—the investor's viewpoint (*W. L. Moise*); Earning capacities and growth rates of selected wood-using industries for the period 1945 through 1958 (*W. H. Meyer*); Income tax problems of large forest properties (*M. Whitaker*); The tax effects of form of ownership of timberlands and changes in the form of ownership (*H. I. Barclay, Jr.*); Considerations in timberland investments in the southeast (*C. G. McLaren*); Financial management in action (*J. A. Segur*).

2275. REINHOLD, F. Vom Forst-(Verwaltungs-)-Amt zum Forst-(Erwerbs-)Betrieb. **[From forest (administrative) district to forest (business) estate.]** *Forstarchiv* 31 (10), 1960 (165–72). 16 refs. [G.g.]

Policy, welfare, advisory-cum-supervisory, and economic functions are distinguished, and detailed proposals presented for a reorganization of the latter, by creating decentralized, largely independent, business units of 10,000 to 30,000 ha. responsible to a finance (not a land-use) department, and modelled on private estates.

2276. COUTU, A. J., and ELLERTSEN, B. W. **Application of linear programming procedures to farm forestry problems.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (177–90). 19 refs.

Discusses a procedure used as part of the Parker Branch Watershed Study in N. Carolina to determine the most profitable combination of agricultural and forestry enterprises for specific farm situations. Solutions for a 20-acre part-time farm and a 250-acre dairy farm, indicating best use of available land, labour, capital and managerial ability, are tabulated.

2277. MACGREGOR, J. J., and JOHNSON, J. M.; BALMAN, F. E. **Survey of private forestry prices. England and Wales. Fourth Report, 1957–59. Part I: Round timber prices. Part II: Minor forest produce prices.** Imperial Forestry Institute, Oxford. 1960. pp. 72. 2 refs. Price 6*s*. [Cf. *F.A.* 18 No. 4475.]

2278. BALMAN, F. E. **Survey of private forestry costs, England and Wales. Piecework rates. No. 2,**

1959–60. Imperial Forestry Institute, Oxford. 1960. pp. 21. Price 3*s*. 6*d*. [Cf. *F.A.* 18 No. 4476.]

2279. Wobst, A. Die wirtschaftliche Lage der Forstbetriebe seit der Währungsreform. **[The economic position of forestry since the [W. German] currency reform.]** *Allg. Forstzeitschr.* 15 (45), 1960 (637–40). 2 refs. [G.]

Presents some data on the deteriorating position in state and private forestry in Germany caused by the adverse movement of prices and costs, particularly wages, salaries and social payments, which in 1957 accounted for 72% of expenses and absorbed 56% of gross receipts. The author concludes that, whatever method of forest valuation is adopted, the financial yield on capital invested is now non-existent or negligible. [Cf. *F.A.* 21 No. 4805.]

2280. Speidel, G. Der Einfluss der Einschlagshöhe auf die Kosten im Forstbetrieb. **[The influence of the volume cut [per ha.] on costs in forestry.]** *Allg. Forstzeitschr.* 15 (46), 1960 (649–54). 8 refs. [G.]

Analyses data from the 1958 accounts of the Lower Saxony Forest Department. Costs per ha. tended to be higher in the regions of heavier yields per ha., not only for logging and transport, but also for road-building, administration, and other fixed charges, and, very largely, establishment costs. Costs per cu. m. on the other hand, fell from almost DM. 100 for districts yielding 1–2 cu. m./ha. to DM 50 for those yielding 3–4, and DM 40 for those yielding ⩾5 cu. m.

65. Special Business Problems of Timber-Growing

See also Nos. 1494, 1778, 1790, 2032, 2210, 2278, 2296, 2300.

2281. Wentzel, K. F. Ein Spitzenbeispiel rentabler Forstwirtschaft. **[A striking example of profitable forestry.]** *Holz-Zbl.* 86 (125), 1960 (1759). 1 ref. [G.]

Presents data on 3½ ha. of Spruce planted at 625 plants/ha. and 4 × 4 m. spacing on a former hardwood site near Wermelskirchen, which, without any tending, had a m.a.i. of 12 cu. m./ha. at age 55, nearly all on crop trees of >1 cu. m. volume. Despite branchiness, net proceeds (i.e. proceeds less extraction costs) for an outturn of 581 cu. m./ha. were DM. 60,000.

2282. Januško, A. D. Ėkonomičeskaja ėffektivnost′ vyraščivanija listvennicy i sosny v BSSR. **[The economics of growing *Larix decidua* and *Pinus sylvestris* in Belorussia.]** *Lesn. Hoz.* 12 (10), 1960 (67–8). [Russ.]

Presents data showing Larch to be a much better economic prospect than Pine on *Oxalis* sites, both qualitatively and quantitatively.

2283. Hall, O. F. **Forest valuation using inventory data.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (199–207).

Discusses 3 methods of valuation of forested property: value for immediate liquidation, based on a single inventory to which are applied stumpage prices by species; market value to any owner for continuous production, developing a regression equation for gross value increment per acre obtained from plot remeasurement data; strategic value to a particular owner for whom a property may have a vital role in the over-all success and profitability of his operations. An illustration of this is given using linear programming techniques for finding the optimum method of operation for a small pulp-mill with alternative sources of wood (viz. land purchase, land already owned, farm woodlands, rail transport from a distance).

2284. Bruns, P. E. **How foresters can determine fair market valuation of timber lands.** *Timberman* 61 (10), 1960 (43, 79).

Outlines the opportunities for consultants in valuations for collateral, for income tax, and for sales, and the two principal methods, the *net-back-to-stumpage* (used by the U.S. Forest Service and the Bureau of Land Management [see *F.A.* 20 No. 5043]) and the *comparative sales* methods, and discusses principles and ethics.

2285. Chou, C. **[The stumpage appraisal method used in Taiwan.]** *Journal of the Agricultural Society of China, Taipei, Taiwan* 24, 1958 (43–7). 4 refs. [Chin.e.] C.G.B.

Describes successive changes since the Japanese occupation in the formula used in Taiwan for calculating stumpage value.

2286. Zimmerman, E. W. **The effect of population pressures on timber needs in the United States.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (591–4). O.R.E.

A short general article, concluding that the immediate need is to narrow the gap between what foresters know about timber growing and what the average landowner practises.

66. Costing of Logging Operations

See also No. 2280.

2287. Botwin, M. Niektóre problemy ekonometriczne mechanizacji prac leśnych. **[Some econometric problems connected with the mechanization of forest operations.]** *Folia for. polon.* (*Drewn.*) No. 1, 1959 (83–102). 11 refs. [Pol.russ.e.]

A (mainly) theoretical paper on the application of mathematical or statistical analysis to solving cost problems connected with the mechanization of forest operations, viz. in determining optimum technical parameters for (*a*) machines and equipment so that cost/unit production is minimum, and for (*b*) local forest facilities (density of forest roads, cableway distances, size of forest dumps, etc.). Includes curves that can be used for selecting suitable equipment and techniques for given forest conditions.

2288. Jindra, J. Určení hospodárnosti přibližování dřeva potahy a traktory. **[Calculating the economics of tractor skidding.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 18, 1960 (277–307). 32 refs. [Cz. russ.g.]

Analyses the data from skidding time-studies in 1954–58, with various types of wheeled and crawler skidding tractors. Basic equations for calculating skidding output and costs are presented, and a graphical method is worked out for determining the limits of the economic use of skidding equipment.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also No. 1311.

2289. Abetz, K., and Adomat, R. Entwicklung der forstlichen Erfolgsrechnung aus der kameralistischen Buchführung. **[Development of a forestry system of profit-and-loss accounting from single-entry accounting.]** *Allg. Forst- u. Jagdztg.* 131 (10), 1960 (217–25). 16 refs. [G.g.e.]

Describes the presentation of financial results by each of the 8 German states and outlines a new scheme for the standardized transformation of the cash statement of receipts and disbursements of a department or district into a profit-and-loss account of state forest enterprise by adjusting, in stages, for items relating to government functions (mainly supervision of private forestry), items of a capital nature, etc. For practical reasons, the criterion for over- or under-cutting is taken to be the permitted annual cut, though it is thought that increment, or the mean of increment and permitted cut (whichever is the lower) would be theoretically more correct.

2290. Speidel, G. Die Wirtschaftsergebnisse der westdeutschen Landesforstverwaltungen. **[Financial results of the forest administrations of the W. German states.]** *Forst- u. Holzw.* 15 (21), 1960 (449–58). 11 refs. [G.]

Covering the period 1949–58.

2291. Malortie, C. von. Försök att jämföra två herrgårdsskogsbruks driftresultat. **[Comparison of financial results of forestry on two estates.]** *Svenska SkogsvFören. Tidskr.* 58 (3), 1960 (205–27). 4 refs. [Sw.]

Presents, for an estate in Östergötland with 334 ha. of forest, and one in Smo̊rland (675 ha.), comparable in composition, yield, etc., data on direct and indirect costs, annual costs and prices of assortments, net surpluses (ignoring changes in growing stock and investment) etc., for the period 1936–59, all converted to 1959 prices. For one of them, labour deployed for various tasks and labour productivity are also discussed.

2292. Gould, E. M., Jr. **Fifty years of management at the Harvard forest.** *Bull. Harv. For.* No. 29, 1960. pp. 30. 14 refs.

Compares the development of standing volume and volumes cut, and of capital values (based on stumpage prices and money incomes) with figures computed on the assumptions (*a*) that the hurricane blowing down more than half of the sawtimber in 1938 had not occurred, (*b*) that half the merchantable timber, and (*c*) all of it, had been cut and sold at peak prices during and after World War I, the proceeds invested and the forests regenerated. Though (*b*) would have resulted in >50% greater volume production and a trebled capital value, money incomes would have been only 12% greater, mainly because of the poor prices in the 1930's. By taking the market situation into consideration, vastly greater incomes and capital gains could have been achieved, and it is argued that the principle of sustained yield lacks the flexibility necessary to deal adequately with biological risks (e.g. by shortening rotations where storm damage to older stands is a recurring hazard) and economic fluctuations. [Cf. *F.A.* 22 No. 1294.]

68. Administration and Organization of Forest Enterprises

See also No. 2275.

681. National (Federal, State) Forest Services and Administration

2293. Shawki, S. K. **Functions of and services rendered by the [Sudan] Forests Department.** *Sudan Silva* 10 (1), 1960 (8–13).

2294. Cepljaev, V. P. O strukture upravlenija lesnym hozjajstvom. **[The structure of forest administration [in the republics of the U.S.S.R.].]** *Lesn. Hoz.* 12 (8), 1960 (77–81). [Russ.]

Describes the structure in Lithuania, Latvia, Belorussia, Tadzhikistan, Armenia, Uzbekistan, Turkmenistan, Azerbaijan, the RSFSR, the Ukraine, Kazakhstan, Kirghizia, Moldavia, and Estonia, and presents a diagram showing the administrative structure from the smallest forest administrative unit up to the Council of Ministers of the U.S.S.R.

2295. **Codification of forest department procedure.** *For. Adv. Newslett. Colon. Off., Lond.* No. 9, 1960: *Appendix C.* pp. 5. *Restricted.* I.F.B.

A review and commentary, reproducing the information supplied from various colonial territories.

683. Office Organization

See No. 1311.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

71. Marketing of Forest Products: General

2296. Sonderheft Holzeinschlag und Holzverwertung. **[Special number: production and utilization.]** *Forst- u. Holzw.* 15 (20), 1960 (417 . . . 443). Many refs. [G.]

Producing wood with a view to using it—or what else? (*C. Ernst*) [emphasizing that it is the consumer, not the producer, who decides what shall be produced]; The timber markets in Finland and in Scandinavia—a comparison (*V. Holopainen*); More national technological utilization as the common task of forestry, the timber trade, research and technology (*W. Klauditz*); Woodworking in Lower Saxony (*Kampers*); Studies on the mechanical splitting of wood (for charcoal burning) in the forest (*B. Strehlke*) [a report of tests with three different machines, with data on output, costs, etc.].

2297. **Home-grown timber**. *Suppl.* to *Timb. Tr. J.* 235 (4390), 1960 (xv . . . xxxiii).
A collection of papers, including: Forestry policy and the home trade (*G. E. H. Calvert*); The marketing situation (*E. R. A. Drew*); Supplies of mining timber (*G. E. Hampson*); Laminated timber in mining (*L. G. Hains*); Newsprint from Welsh trees (*A. W. Camburn*).

2298. ERVASTI, S. Metsäntuotteet Ison-Britannian rakennusaineiden mainonnassa. **[The position of forest products in advertising of building materials in Great Britain.]** *Silva fenn.* 104 (3), 1960. pp. 61. 18 refs. [Fi.e.*e.*]

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See Nos. 2286, 2297, 2299.

73. Prices

See also No. 2277.

2299. ERVASTI, S. Suomesta myydyn havusahatavaran hintasuhteiden muutokset vuosina 1932–38 ja 1951–56. **[Changes in the price ratios of sawn softwood sold by Finland in 1932–38 and 1951–56.]** *Acta for. fenn.* 67 (6), 1958 (1959). pp. 85. 27 refs. [Fi.e.*e.*]
Details for sales to U.K., Netherlands, and Belgium.

2300. MOLTESEN, P. Vedpriser og træartsvalg: nåletræ. **[Wood prices and choice of species: conifers.]** *Dansk Skovforen. Tidsskr.* 45 (10), 1960 (416–30). [Dan.dan.]
Compares the prices (converted from DM. to Kr.) by assortments and by dimensions for Norway Spruce, Larch, Scots Pine and Douglas Fir, obtained at timber sales in Hesse in 1959. Concludes that Spruce fetched the best prices for dimensions up to ca. 30 cm. mid-diam., and Larch and Pine, which followed very similar price curves, above that size. Material for Douglas was small, but its prices probably fell between the two groups.

74. Trade Policy

2301. **Report of the research and development committee of the Timber Development Association for the year 1959.** Timber Development Association, London. 1960. pp. 66.

2302. **The Emmerson Report**. *Timb. Tr. J.* 235 (4389), 1960 (51–7).
Recommendations include a reorganization of the Timber Trades Federation on a basis of associations (not individual firms), functions (agent, importer, merchant) and areas, additional financing through an import levy, and restricting the field of research while expanding extension activities.

2303. **Tariff board enquiry. Merchants recommend no increase in duties**. *Aust. Timb. J.* 26 (8), 1960 (25–9, 31, 33).
Considerable information (incidental to the discussions) is given on species and assortments imported, types of market, suggestions for assistance (other than tariff protection) to the local milling industry, etc.

78. Economics of Transport

See No. 1935.

79. Economics of the Forest Products Industries

See also Nos. 2439–40.

2304. ERVASTI, S. Suomen metsäteollisuuden laajentamismahdollisuudet tuotteiden käytön kehityksen kannalta. **[The possibilities of expanding Finland's industry by developing the utilization of forest products.]** *Silva fenn.* 97 (1), 1959. pp. 26. 10 refs. [Fi.e.*e.*]
Gives comparative figures of expansion in each year from 1946 to 1956, from Finland, Sweden, U.S.S.R., U.S.A., and Canada, for sawn wood, plywood, pulp (total, mechanical, chemical), newsprint, other paper, paperboard, and fibreboard.

2305. LINNAMIES, O. Perä-Pohjolan metsäteollisuuden laajentamismahdollisuuksista. **[The possibility of expanding the forest industry in Lapland.]** *Metsät. Aikak.* 1960 (9), (288–91, 322). 8 refs. [Fi.e.*e.*]
Presents graphs showing present-day development of increment, allowable cut, mean volume/ha., and age structure, and examines critically the supply of raw material in relation to demand, concluding that, in view of the probable deficiency of mature conifers except in some less accessible regions, no future expansion of the industry can be recommended.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 1628, 1642, 2296.

2306. **Industry—education**. *For. Prod. J.* 10 (10), 1960 (515–22, 533–5).
A series of articles including: Wood-technology training—where does it belong? (*A. J. Panshin*); The need for emphasis on the basic sciences in the wood technology curriculum (*H. O. Fleischer*); Vocational training in wood technology (*E. S. Johnson*); The wood technology curriculum in the forestry school (*G. A. Garratt*); and Relation of the national wood promotion program to educational training programs (*P. R. Beattie*).

2307. **[The Japanese wood industry.]** *Wood Ind., Tokyo* 15 (9), 1960. pp. 49. Many refs. [Jap.] P.R.
Contains mainly reviews and general articles on rotary-lathe cutting and industrial timber drying practice (English titles listed), and an original

research paper by *M. Nobukini*, with English summary, giving the results of an investigation into the effects of moisture content on pressure creosoting of Sugi pylons.

2308. **[The Japanese wood industry.]** *Wood Ind., Tokyo* 15 (10), 1960. pp. 49. Many refs. [Jap.] P.R.

Contains mainly reviews and miscellaneous reports on the forest products industry in Japan (English titles listed), and an original research paper by *D. Hayashi* and *A. Watabayashi*, with English summary, on the effects of nose-bar opening on veneer slicing of *Betula maximowicziana*.

2309. STERN, E. G. **Recent yields of Wood Research Laboratory of Virginia Engineering Experiment Station.** *Bull. Wood Res. Lab. Va. Polyt. Inst.* No. 41, 1960. pp. 24. 25 refs.

Summarizes recent research and development work, published or soon to be published, under the following heads: All-nailed king-post trussed rafters; V.P.I.-Lureco framing system; Plywood diaphragms; Framing without sheathing; Nailing of sheet metal roofing and siding; Nailing of Redwood for exposed structures; Nailing of Hickory; Nailing of fruit-picking boxes; and Effectiveness of portable nailing machines.

2310. POTKONJAK, M., PAŠALIĆ, J., and POSTNIKOV, A. Neki aktuelni problemi prerade bukovine. **[Some current problems in the conversion of Beech.]** *Nar. Šumar, Sarajevo* 13 (7/8), 1959 (411–30). [Croat.g.]

Discusses: the place of Beech in the wood industry of Bosnia and Herzegovina, giving current production by assortments and comparing figures for 1956 with estimates for 1966; preservation; sawing methods and mill capacity; use of waste for pulp, fuel, etc.

2311. COTE, W. A., JR. **High speed motion pictures in wood research.** *Photogramm. Engng.* 25 (1), 1959 (61–5). L.S.

High-speed motion-picture photography can be a useful tool in the various fields of wood research. It provides a means of seeing action that is too rapid for the human eye to perceive. A magnification of time as great as 1000 can be achieved by projecting films at standard speed that have been exposed at the maximum rate of 16,000 frames per second. Some aspects of the machining and the mechanical testing of wood have been studied through the use of the high-speed motion-picture camera. A description of the equipment, methods of operation and application to specific studies is given. Illumination, synchronization of the camera with the event, and other general problems are discussed. *Author's summary.*

81. Wood and Bark: Structure and Properties

See also Nos. 2411, 2531.

810. General Information on Woods

See also No. 1494.

2312. ARKWRIGHT, P. **Know your timber, Nos. 77–79.** *Woodwkg. Ind.* 17 (9–11), 1960 (495; 557; 615). P.R.

Binuang (*Octomeles sumatrana*); Canadian Spruce (*Picea* spp.); and Sapele (*Entandrophragma cylindricum*).

2313. **World timbers. Nos. 2–3.** *Suppls. to Wood* 25 (10; 11), 1960. Each pp. 2.

English Walnut (*Juglans regia*); and Sapele (*Entandrophragma cylindricum*).

2314. SEKHAR, A. C., and BHATIA, D. N. **Physical and mechanical properties of woods tested at the Forest Research Institute, Dehra Dun: Report VIII.** *Indian For. Rec.* (*n.s.*) (*Timb. Mech.*) 1 (9), 1957 (1960), (155–7 + 2 tbls.).

[Cf. *F.A.* 21 No. 3675.] The present report deals with *Tectona grandis, Dalbergia cultrata, Millettia pendula, Anthocephalus cadamba, Phoebe goalparensis, Artocarpus integrifolius, Dalbergia sissoo, Grewia elastica*, and *Elaeocarpus tuberculatus*. All test data are recorded for wood in the green state and air-dry.

2315. Drei westafrikanische Sperrfurnierhölzer, Framiré, Bombax, Musanga. **[Three West African plywood veneer timbers: *Terminalia ivorensis*, *Bombax brevicuspe*, and *Musanga smithii*.]** *Holz-Zbl.* 86 (137), 1960 (1938). 9 refs. [G.]

Distribution, nomenclature, description of the trees and the wood, properties and uses.

2316. CHAVARRÍA F., R. A. Algunas especies maderables de Costa Rica. **[Some timber species of Costa Rica.]** *Rev. Agric., Costa Rica* 32 (7/8), 1960 (214, 216–9). [Span.] ABD.R.

Lists 39 timbers by their trade names, giving Latin equivalents and a brief note on the characteristics and uses of the wood.

2317. WATSON, C. J. J. **Queensland timbers for joinery and mouldings.** *Pamphl. Qd. For. Serv.* No. 3, 1958. pp. [2] + 48.

Describes a wide range of hardwoods and softwoods, discussing their hardness, workability, durability, strength, gluing, staining, polishing, appearance and defects, seasoning, and utility of sapwood, with respect to their use in internal and external joinery and mouldings.

2318. **Properties of Australian timbers: Cypress Pine.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 266, 1960 (4).

Briefly covers habitat and distribution, timber, seasoning, uses, and availability of *Callitris columellaris* and *C. intratropica* (the main commercial species), and of *C. endlicheri* (syn. *C. calcarata*) and *C. macleayana.*

2319. **Utilization properties of locally grown *Pinus radiata* and *Pinus patula*.** *Tech. Note Util. Div. For. Dep. Tanganyika* No. 22, 1959. pp. 5 + 2 tbls.

Describes studies made in collaboration with the

Kenya Forest Department on the properties of slow- and fast-grown *P. radiata* and *P. patula* from the Kenya Highlands. The investigations covered strength testing, weight and shrinkage, air drying, creosote preservative treatments, and machine woodworking (rip-, band- and cross-cut sawing, nailing, spindle-moulding, planing, boring and mortising). Tabulated results are appended.

2320. **Keruing (*Dipterocarpus caudiferus* Merr.) from North Borneo. Consignment No. 919.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 7. 1 ref. P.R.

Gives a general description of the timber, and details of its seasoning, mechanical and wood-bending properties, resistance to insect attack, natural durability, working properties, uses, and responses to preservative treatments. Its suitability for plywood and veneer is particularly stressed.

2321. **Red Mahogany.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 12 (1), 1960 (3–7). 3 refs.

Gives details of the distribution of *Eucalyptus resinosa* in New South Wales and Queensland, botanical description and description of the wood, seasoning, utilization, working qualities, durability, and supply, and includes tabulated data on physical and mechanical properties.

2322. **Properties of Australian timbers. Silvertop Ash.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 267, 1960 (4).

Discusses habit and distribution of *Eucalyptus sieberiana* in New South Wales and Victoria, its timber, seasoning, uses, and commercial availability.

2323. HOLZ, D., and BRUCKNER, K. Über gemeinsame und unterschiedliche Eigenschaften von Stiel-, Trauben- und Roteichenholz. [**Common and differing properties of wood of *Quercus robur*, *Q. sessiliflora* and *Q. rubra*.**] *Holzforsch. u. Holzverwert.* 11 (4), 1959 (88–99). 64 refs. [G.g.e.] P.R.

Compares anatomical, physical, and chemical properties, and also some differences between broad- and narrow-ringed wood of *Q. sessiliflora*, and discusses the new E. German HOMA as far as it concerns Oak.

2324. NÁJERA Y ANGULO, F. Aplicaciones industriales de la madera de chopo: estudio técnico y económico. [**Industrial uses of Poplar wood: technical and economic study.**] *In* Conferencias sobre el chopo y sus aplicaciones. Sección de Publicaciones de la Escuela Técnica Superior de Ingenieros de Montes, Madrid. 1960. pp. 67–97. [Span.]

Reviews (1) the properties and characteristics of Poplar wood, (2) its industrial uses, and (3) its management in various parts of the world.

811. Structure, Identification

See also Nos. 1418, 1501, 1508, 2336, 2394.

2325. STERN, W. L., and CHAMBERS, K. L. **The citation of wood specimens and herbarium vouchers in anatomical research.** *Repr.* from *Taxon* 9 (1), 1960 (7–13). 3 refs. X.

Gives a list of abbreviations of research institutes etc. possessing collections of wood specimens, and a method of citing specimens by source, number, collector (where known) etc.

2326. KUKACHKA, B. F. **Identification of coniferous woods.** *Tappi* 43 (11), 1960 (887–96). P.R.

Gives instructions in the sequential use of primary diagnostic features for the identification of coniferous woods. These may be used from the data chart shown or by sorting marginally perforated cards. Microscopic features are necessarily stressed because of the greater accuracy obtainable from their use. The majority of the species listed and described are found in the continental U.S.A. and Canada. *From author's summary.*

2327. VIHROV, V. E., and KOSTAREVA, L. V. Anatomičeskoe stroenie drevesiny kornej nekotoryh hvojnyh porod. [**Anatomical structure of rootwood of some conifers.**] *Bot. Ž.* 45 (9), 1960 (1259–70). 33 refs. [Russ.e.]

Studies were made on roots of *Abies sibirica*, *Picea abies*, *Larix sibirica*, *Pinus sibirica*, *P. sylvestris*, *Juniperus communis* and *Thuja orientalis*, all 10–15 years old, in a nursery near Moscow, and also of *Cupressus funebris* (using material sent from China). The secondary rootwood differed in several ways from stemwood of the same tree, the differences being particularly striking in *P. abies*, *L. sibirica*, *Pinus sibirica* and *P. sylvestris*. Rootwood ontogeny also differed from that of stemwood [cf. *F.A.* 21 No. 3661]. A key is presented for the identification of rootwood of the 8 species dealt with, based on microscopic anatomical characters.

2328. LYR, H., and BERGMANN, J. H. Zur Frage der anatomischen Unterscheidbarkeit des Holzes einiger *Salix*-Arten. [**The anatomical differences in wood of some *Salix* spp.**] *Ber. Dtsch. Bot. Ges.* 73 (7), 1960 (265–76). 7 refs. [G.g.] O.B.D.

Describes and compares the anatomical features of *Salix caprea*, *S. viminalis*, *S. cinerea*, *S. acutifolia*, *S. alba*, *S. purpurea* and *S. pentandra*.

811.1. Anatomical Elements and Tissues

See also Nos. 2346–8, 2413, 2459.

2329. ODINTSOV [ODINCOV[s]], P. N. **Present day views on the structure of cellulose and cell walls of plants.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4673, 1960. pp. 26 + 4 plates, 4 drawings. 106 refs. Transl. by R. Zatorski from *Trudy Akademii Nauk Latvijskoj SSR, Riga* 1957 (12), (5–24). Limited distribution.

A review of world literature.

2330. MOOR, H. Platin-Kohle-Abdruck-Technik angewandt auf den Feinbau der Milchröhren. [**Platinum-carbon replica technique applied to the fine structure of the latex tubes [of *Euphorbia splendens*].**] *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4696, 1960. pp. 25 + 7 plates, 10 drawings, 1 gph. 18 refs. Transl. by E. Feigl from

Journal of Ultrastructure Research 2 (4), 1959 (392–422). Limited distribution.

Describes the technique, and its application in the study of the growth of the cell-wall of latex tubes in *E. splendens*.

2331. **Wood and fibre structure. Cell wall organization. (I) In fibres and tracheids. (II) In sieve cells of phloem.** *Extr.* from *Rep. For. Prod. Aust. 1959/60*, 1960 (6–7).

(I) Study of ultra-thin sections demonstrated that all layers of the cell wall are lamellated, and that the cellulose microfibrils are sheaf-like aggregates, so that there is a dispersion of the microfibrils about the direction of orientation. In differentiating fibres and tracheids, successive stages of elaboration of the secondary wall were observed, which confirm the results of purely structural observations. (II) As the major path of carbohydrate translocation is in the sieve cells (s.c.'s), their anatomy is of particular physiological significance, and in arborescent plants instances have been recorded where the s.c. lumen is very small and may be almost occluded because of the great thickening of the walls of these elements. Examination in polarized light of the s.c.'s of some [unspecified] species showed that the wall consists of 3 layers: a birefringent (*a*) outer and (*b*) inner layer, separated by (*c*) the so-called "nacreous" thick amorphous central layer. The decrease in the thickening of the wall during senescence of the phloem is due to a decrease in the thickness of layer (*c*) which, viewed by ordinary microscope, shows a tendency in some cases to lamellation. Replica techniques showed layers (*a*) and (*b*) to consist of microfibrils orientated roughly transverse to the cell axis, and it was apparent from ultra-thin sections that the (*c*) layers contain both microfibrils in a loose network and amorphous components. The fact that these lamellae are less obvious in thicker sections suggests that some anastomosing between them may occur in a plane ⊥ to the cell surface.

2332. JURBERGS, K. A. **An electron microscope study: Slash Pine [*Pinus elliottii*] and Sweetgum [*Liquidambar styraciflua*] fibres.** *Tappi* 43 (10), 1960 (865–71). 7 refs. P.R.

Discusses the evidence obtained from ca. 200 electron-micrographs of the fine structure of selected wood-pulp fibres from *P. elliottii* and *L. styraciflua.*

2333. FREY-WYSSLING, A., MÜHLETHALER, K., and BOSSHARD, H. H. Über die mikroskopische Auflösung der Haltefäden des Torus in Hoftüpfeln. **[The microscopical resolution of the torus strands in bordered pits.]** *Holzforsch. u. Holzverwert.* 11 (5), 1959 (107–8). 7 refs. [G.g.e.] P.R.

In conifers, the torus strands in bordered pits are submicroscopic in the vicinity of the cambium but with age they increase in width by fasciation and become visible under an ordinary microscope. They are, therefore, a suitable subject for demonstrating the resolution limits of such microscopes.

2334. JAYME, G., HUNGER, G., and FENGEL, D. Das elektronenmikroskopische Bild des Cellulosefeinbaues verschlossener und unverschlossener Hoftüpfel der Nadelhölzer. **[The cellulose fine structure of closed and unclosed bordered pits in conifers, as seen by electron microscope.]** *Holzforschung, Berlin* 14 (4), 1960 (97–105). 16 refs. [G.g.e.] P.R.

A full account, with photomicrographs of closed and open pits of Scots Pine and Norway Spruce, including the way in which closure of the pit membrane takes place.

2335. STEMSRUD, F. Über die Feinstruktur der Hoftüpfel-Schliesshaut von Nadelhölzern. II. **[Fine structure of the closing membrane of bordered pits in conifers. Part II.]** *Holzforschung, Berlin* 13 (1), 1959 (16–20). 5 refs. [G.g.e.] P.R.

Experiments with radioactive preservatives were made on Scots Pine wood to verify results obtained with the electron microscope [see *F.A.* 18 No. 3290]. It appeared that the inner zone of sapwood next to the heartwood was penetrated by the preservatives more than the rest of the wood, and accordingly it is assumed that a connexion exists between the perforation of the central part of the pit membrane and the increased accumulation of preservatives in this sapwood zone.

2336. ČAVČAVADZE, E. S. Analiz diagnostičeskih priznakov drevesiny hvojnyh. Pory na poljah perekresta u nekotoryh taksodievyh. **[Analysis of the diagnostic features of the wood of conifers. Pits on the cross-fields in some of the Taxodiaceae.]** *Dokl. Akad. Nauk SSSR* 133 (5), 1960 (1235–8). 7 refs. [Russ.] A.P.B.

Investigations were made on *Taxodium distichum* and *Metasequoia glyptostroboides* to determine structural changes in the cross-field pits during the ontogeny of the wood, and the changes in the number of pits on the cross-fields with age of stem. In both species the pits were cupressoid in the younger wood and gradually became taxodioid in the more mature wood. The cross-fields, and the pits themselves, increased in size with age of wood, and pit frequency increased from the pith to the bark.

2337. BANNAN, M. W. **Some factors influencing cell size in conifer cambium.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (18–9). [E.] O.B.D.

During the growth of the first few years, certain changes are observable in cambial behaviour in conifers. The anticlinal divisions involved in cambial cell multiplication tend to decrease relative to radial increment, and the rate of gain of new initials falls off. Cell length gradually increases. In the peripheral growth of mature trees, much variation occurs from tree to tree. In some there is relative cambial stability, while in others anticlinal divisions follow in rapid sequence and there is continued replacement of old initials by new ones. As a rule, cell length is somewhat less in vigorous than in slow growing trees. In fluted stems, cell length is appreciably less in the grooves than in the neighbouring convex sections. No consistent differences in cell size have been detected between trees on wet and on dry sites. [Cf. *F.A.* 19 No. 3390.]

2338. BANNAN, M. W. **The vascular cambium in conifers.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (19). [E.] O.B.D.

In the conifers the generative zone between xylem and phloem consists of a uniseriate initiating layer and derived tissue mother cells. Periclinal divisions occur throughout the cambial zone, but during the period of maximum growth greatest activity occurs among the xylem mother cells. By way of contrast, anticlinal divisions, which are involved in increasing girth of the cambium, take place mostly in the initiating layer. The rate of anticlinal division is generally such as to cause overproduction and competition among the new-formed initials. Usually the initials that are largest, and have the largest areas of ray contact, persist and the shorter maturate or become reduced to ray initials.

2339. EVERT, R. F. **Ray origin in *Pyrus communis* L.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (108). O.B.D.

The frequency with which new ray initials (r.i.) arise in the vascular cambium of *Pyrus communis* may vary considerably from one part of the cambium to another. New r.i.'s arise in the following ways: (1) through pseudo-transverse division near one end of a fusiform initial, with the subsequent conversion of the shorter segment to r.i.'s; (2) through pseudo-transverse division near the centre of a fusiform initial, followed by reduction in length of one sister cell and its conversion to r.i.'s; (3) through anticlinal division, which gives rise to a segment off one side of a fusiform initial, followed by reduction in length of the segment and its conversion to r.i.'s; and (4) through reduction in length of a fusiform initial, without anticlinal division, followed by its conversion to r.i.'s. Increase in height of rays may result (1) from the loss of intervening fusiform initials, (2) through transverse (anticlinal) division of r.i.'s, (3) through vertical elongation (intrusion) of marginal r.i.'s, (4) through the union of newly formed r.i.'s with pre-existing r.i.'s, or (5) through a combination of these. Decrease in height of a ray may result from the loss of r.i.'s or from the division of a ray by a fusiform initial undergoing apical intrusive growth.

2340. NYRÉN, V., and BACK, E. **Characteristics of parenchymatous cells and tracheidal ray cells in *Picea abies* Karst. The resin in parenchymatous cells and resin canals of conifers. VI.** *Svensk PappTidn.* 63 (16), 1960 (501–9). 16 refs. [E.e.sw.g.] P.R.

The various types of cell are described and illustrated by photomicrographs. The parenchymatous ray cells (one type only) are thick-walled, with a relative pit area of only ca. 5% compared with 50% in Scots Pine; this is probably one of the reasons for the slower alkaline de-resination of Spruce pulps. The tracheidal ray cells also show less variation in form and appearance than those of Pine; their frequency relative to the ray parenchyma cells is 1/2·7 compared with 2·8/1 for Pine. Vertical parenchyma cells occur only sparsely, and are thick-walled and similar to ray parenchyma. Occasional vertical cell rows of short tracheids, "strand tracheids", are observed. The epithelial cells are rather thick-walled. The parenchymatous pith cells are short, variable in shape, and rather similar to those of Pine.

2341. NYRÉN, V., and BACK, E. **The dimensions of tracheidal and parenchymatous ray cells of *Picea abies* (Karst.) pulpwood. The resin in parenchymatous cells and resin canals of conifers. VII.** *Svensk PappTidn.* 63 (18), 1960 (619–24). 10 refs. [E.e.sw.g.] P.R.

Measurements were made on pulps and on tangential wood sections. Ray parenchyma cells were significantly longer than ray tracheids but differences in height and width were small. A pronounced negative relationship between cell length and cell height was found for tracheids, and a weak, but still significant, one for parenchyma cells. Dimensions of Pine [cf. *F.A.* 20 No. 933] and Spruce cells are compared.

2342. ZIEGLER, H. **Our knowledge of translocation in rays.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (441–2). O.B.D.

Both their structure and experimental evidence show that rays are not necessary for the conduction of water from the sapwood to the growing cambium and phloem tissue, but that they are necessary to supply water from the sapwood to the heartwood. Experiments with girdling and with isotopes reveal that even radial salt transport, partly at least, follows the rays. The assimilates are translocated from the phloem through the rays into the wood (this is especially evident in girdling experiments), but a centrifugal transport through the wood rays towards the cambium has not yet been demonstrated, though it probably exists. The passage of assimilates from the sieve tubes into the rays probably takes place with the help of the companion (Strasburger) cells. Recent anatomical research on the cambium gives evidence that the supply of nutrients to the growing cambium is affected by the rays. The cambium initials for the rays are unique, being meristematic cells through which an intensive transport of material constantly passes. Over short distances, simple diffusion seems sufficient to account for the transport of assimilates in rays, but for longer distances the presence of accelerating mechanisms must be assured. The rays also play an important part in the radial transport of gases.

2343. FREY-WYSSLING, A. **Cytology of heartwood ray cells.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (123). O.B.D.

The cytology of ray cells was studied in sapwood (s.w.), intermediate wood and heartwood (h.w.), using samples obtained by means of an increment borer. Living ray parenchyma are found in the s.w., while the ray cells appear to have lost their protoplasm in the h.w. The nucleus has an oblong shape in the outer s.w., rounds off more and more in the transition zone, disintegrates into 2 or 3 pieces and becomes pycnotic at the h.w. boundary. Starch grains, if present, persist throughout the s.w. and disappear only in the narrow intermediate zone. The same is true for the mitochondria, whose reducing power can be clearly demonstrated in the s.w. near the cambial zone. H.w. formation is intimately related to the cytological breakdown of the ray cells. European timbers investigated were Pine, Larch and Yew with h.w., Spruce without h.w., and Beech and Ash with facultative h.w.

2344. Frey-Wyssling, A., and Bosshard, H. H. **Cytology of the ray cells in sapwood and heartwood.** *Holzforschung, Berlin* 13 (5), 1959 (129–37). 23 refs. [E.e.g.] P.R.

Cytological differences in the living ray cells with increasing distance from the cambium were studied in 7 conifer and 5 hardwood species. The oblong nuclei round off, disintegrate and disappear before the boundary of the heartwood is reached. Although starch granules are detectable in the ray cells throughout the sapwood, they are rather abruptly no longer observed when the zone of transition to heartwood is reached. Chemical and metabolic changes accompanying the transition from sapwood to heartwood are deduced from the cytological observations. [Cf. *F.A.* 15 No. 631; 22 No. 2344.]

811.2. Special Features and Abnormal Structure

See also No. 2330.

2345. Obaton, M. Les lianes ligneuses à structure anormale des forêts denses d'Afrique Occidentale. **[Woody lianas of the W. African rain forests with anomalous [wood] structure.]** *Ann. Sci. nat. (Bot.) (Sér. 12)* 1 (1), 1960 (1–220). 5 pp. of refs. [F.f.] O.B.D.

Seven types of anomalous stem structure are recognized, and a study is presented of the distribution of the stem types among the different families, and of the wood anatomy of the species showing these anomalies.

811.4. Growth Rings. Early and Late Wood

See also Nos. 2354, 2381.

2346. Bozkurt, Y. Belgrad ormanında önemli bazı ağaç türlerinde yıllık halka gelişimi üzerine araştırmalar. **[Investigations on the development of the annual ring in some important tree species in the Belgrad forest [near Istanbul].]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (29–56). 30 refs. [Turk. e.e.]

Studies were made on (1) *Quercus hartwissiana* (40–60 years old), (2) *Q. conferta* (25–50), (3) *Castanea sativa* (32–38), (4) *Fagus orientalis* (35–45), (5) *Carpinus betulus* (25–40), (6) *Alnus glutinosa* (30–50), (7) *Pinus nigra* var. *caramanica* (25), and (8) *P. pinea* (25). During the resting period, the cambium was 7–10 cells wide in (1), 5–7 in (2) and (6), 6–7 in (3), 5–6 in (4) and (5), and 8–10 in (7) and (8). Cambial activity in trees at the margin or in an opening of the stand started 3–12 days earlier than in close-growing trees. It first started at a height of 5 m., working down to b.h. Cell division began earliest in (3) and latest in (5). The growing season of ring-porous woods lasted 5½–6 months, of diffuse-porous woods 4½–5 months, and of conifers 5½ months. Late-wood formation started as leaf development was completed in (1), (2) and (3); at the beginning of Aug. in (6); in mid-June in (7); and in late June in (8). Full details are given in the English summary.

2347. Schultze-Dewitz, G. Einfluss der Kronenhöhe auf den Jahrringbau sowie auf die Faserlänge und den Markstrahlanteil bei der Fichte verschiedener Altersklassen. **[Influence of crown length on annual-ring structure and on fibre length and the proportion of medullary rays in Spruce of various age classes.]** *Holzforsch. u. Holzverwert.* 11 (3), 1959 (67–74). 30 refs. [G.g.e.] P.R.

[Cf. *F.A.* 19 No. 4815.] Increment cores were taken at b.h. from Spruce (dominant, medium, suppressed) of four different ages in the S. Tyrol (*a*) and the Harz (*b*). Annual-ring width and late-wood % were less, and crown % was greater, in (*a*). Fibres were longest in dominants and shortest in suppressed trees; fibre length was inversely proportional to late-wood %. Crown class scarcely affected the number of rays, but did affect their height; ray height and late-wood % were inversely proportional. Generally speaking, dominants had big crowns, broad annual rings, long fibres, high rays and a high % of ray cells, and a low late-wood %; suppressed trees had the reverse, and intermediate trees were in between.

2348. Schultze-Dewitz, G. Wie wirkt sich der Einfluss der Stellung eines Baumes im Bestand auf seine Holzstruktur. **[The effect of a tree's position in the stand on its wood structure.]** *Holzforsch. u. Holzverwert.* 12 (1), 1960 (30–3). 38 refs. [G.g.e.] P.R.

Largely a summary of the author's own work on Spruce, Silver Fir, Scots Pine, and Larch [cf. preceding abstract].

2349. Żelawski, W., and Wodzicki, T. Różnicowanie słoja drewna siewek świerka pospolitego (*Picea excelsa* Lk.) w związku z rytmika dziennego oświetlenia. **[Differentiation of the wood of *P. abies* seedlings in relation to the daily light rhythm.]** *Folia for. polon. (Leśn.)* No. 2, 1960 (113–21). 3 refs. [Pol.russ.e.]

Generally confirms earlier findings with Larch [cf. *F.A.* 19 No. 168; 20 No. 951], viz. that short-day illumination not only causes photoperiodic reaction of the shoot apex but also the formation of late wood.

811.5. Sapwood and Heartwood

See Nos. 2343–4, 2412, 2523.

811.6. Texture, Grain, Figure

See also No. 2381.

2350. **Home-grown timber investigations.** *Extr. from Rep. Dir. For. Prod. Res. Bd., Lond. 1959*, 1960 (5).

[Cf. *F.A.* 17 No. 4373.] As part of the scheme for studying the variation in anatomical structure of Sitka Spruce throughout the U.K., a special instrument was designed for measuring the inclination of the grain in cross-sectional disks. The method involves splitting each disk in two along a diameter and measuring the inclination of the split radial surface at intervals from pith to bark. A separate plan for investigating more intensively the pattern of variation of anatomical structure within the individual tree has also been worked out, but systematic examination of U.K. Sitka according to this plan has not yet begun.

811.7. Phloem; Bark

See also Nos. 1465, 2331.

2351. Hepton, C. E. L., and Preston, R. D. **Electron microscopic observations of the structure of sieve-connexions in the phloem of Angiosperms and Gymnosperms.** *J. exp. Bot.* 11 (33), 1960 (381–94 + 6 plates). 36 refs. O.B.D.

The sieve elements of *Pinus sylvestris*, *Sorbus aucuparia*, *Vitis vinifera*, and *Cucurbita pepo* were examined electron-microscopically in ultra-thin section, and the structures of the corresponding sieve areas or sieve plates are described and compared. In Pine the sieve areas contain groups of connecting strands that enter the wall from the lumen side as individuals but coalesce within it in the median cavity. This cavity has developed by wall breakdown in the middle lamella and primary wall region, and corresponds to the median nodule visible under an ordinary microscope. Neither in this nor in the other species observed is there any visible closing membrane. Structural differences between the four species are shown to suggest that the major trend in the evolution of specialized conducting strands has been the enlargement of the connecting strands from groups of small separate strands to a smaller number of larger strands as the median cavity becomes enlarged to form a canal through the wall. The connecting strands appear invariably to be dense, highly osmiophilic and continuous with the cytoplasmic surface of the cell. No signs of micropores or of other tubular structures in the strands have been found. The structures thus revealed are more nearly compatible with active transport of materials across the sieve plate than they are with any purely physical mechanism. It is suggested that they are incompatible with any mass flow hypothesis. *From authors' summary.*

812. Physical and Mechanical Properties

See also Nos. 1489, 2079, 2411, 2487.

2352. Bađun, S. **Application of radioactive isotopes in wood technology.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4715, 1959. pp. 14 + 11 gphs. 7 refs. Transl. by A. P. Veseli from *Drvna Ind.* 10 (5/6), 1959 (86–93). [See *F.A.* 21 No. 943.] Limited distribution.

2353. Gillwald, W. Anwendungsmöglichkeiten von Isotopen in der Holzforschung. **[Isotopes in wood research.]** *Arch. Forstw.* 9 (9), 1960 (771–88). 6 refs. [G.g.russ.e.]

Discusses German and Russian papers, and preliminary research at Eberswalde including the use of isotopes for measuring density, thickness and moisture content of wood and composite boards, in the study of diffusion and the movement of liquids in wood, and as wood preservatives. Where β-rays were involved in m.c. measurements, their absorption increased slightly up to fibre-saturation point, and then strongly thereafter, allowing its determination at the clearly defined bend in the curve, and suggesting the possibility of constructing radiation moisture meters for the whole range of values from oven-dry to saturation. [Cf. *F.A.* 20 No. 2282.]

2354. Veermets, K. Põhja-Eesti loomännikute puidu tehnilised omadused. **[Physical and mechanical properties of Scots Pine timber from the alvar forests of N. Estonia.]** *Loodusuur. Seltsi Aastar., Tallinn* No. 51, 1958 (1959), (73–82). 2 refs. [Est. russ.g.*russ.g.*] N.L.L.

Tabulates data on ring width, late-wood %, density, static bending strength, compression ||, and hardness, at various heights in the tree.

2355. Chin Fung Kee. **Mechanical and physical properties of Kapur (*Dryobalanops aromatica*).** *Timb. Technol.* 68 (2258), 1960 (455–7). 4 refs.

Graphs the variation of compressive strength, shear strength and moduli of rupture and elasticity with moisture content. Results indicate that in compression and bending, the exponential strength/m.c. relationship observed in other species also applies to *D. aromatica.* The modulus of elasticity was constant for m.c.'s $\leqslant 10\%$, and varied almost linearly for m.c.'s of 10–25%. Observations were also made on density and shrinkage variations.

2356. Vorontsov [Voroncov], R. V., and Bagrova, R. Kh. [R. H.]. **A rapid method for the determination of moisture in wood.** *Trudy Uralskogo Lesotehničeskogo Instituta* No. 12, 1958 (145–7). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (16), 1960 (16826). P.R.

Describes the method, in which ca. 1 g. of wood [unspecified] is weighed, and wetted with 10 ml. of anhydrous, $CuSO_4$-dried alcohol. The alcohol is ignited and, when the flame dies, the operation is repeated with 5 ml. alcohol, once if m.c. is $\ngtr 25\%$, or twice if $>25\%$; the sample is weighed while still warm. The accuracy of the method was tested on several wood samples with m.c.'s ranging from 5·52 to 28·9%, the values obtained agreeing within 0·26–0·98% with determinations made by conventional oven-dry techniques.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 1874, 2355, 2375, 2384, 2504.

2357. Yazawa, K. **[The seasonal water content of sapwood and heartwood of broad-leaved trees, especially of Beech (*Fagus crenata* Blume).]** *J. Jap. Wood Res. Soc.* 6 (4), 1960 (170–5). 8 refs. [Jap.jap.e.*e.*] P.R.

In an investigation of the seasonal changes in the m.c. of Beech heartwood (h.w.) and sapwood (s.w.) 29 trees were felled ranging from 25 to 50 cm. d.b.h., 16 to 25 m. in ht., and 90 to 245 years old, a large number containing false h.w. in the stem. The results obtained (fully tabulated in English) indicate that: (i) the mean m.c. is higher for s.w. than h.w. in winter (Nov.–Feb.), and *vice versa* for April–Oct.; (ii) the horizontal distribution of the m.c. of Beech (shown in graphs for 4 different stem heights) is very varied, that of the s.w. being higher than that of h.w. in some samples but lower in others; (iii) in certain other broadleaved species (for which tabulated data are included), the m.c. of h.w. is sometimes the higher, but this is usually a temporary and reversible condition.

2358. Todorovski, S. Sodržina na vlaga vo surovoto deblo na dabot gorun (*Quercus sessiliflora*, Salisb.). **[Moisture content in the freshly felled and unconverted stem of *Q. sessiliflora*.]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 12, 1958/1959 (1959), (101–29). 13 refs. [Maced.maced.f. *g.g.*]

Tests were made of the m.c. of the wood of 21 freshly felled *Q. sessiliflora* aged 36–126 years from the Pesjak district. Examination of cores taken in a radial direction showed that m.c. decreased going inwards from the bark, to increase again near the stem centre. Mean m.c. of sapwood (s.w.) was 75·5% vs. 54·8% for heartwood (h.w.). Differences longitudinally were small, m.c., with rare exceptions, being greater near the butt than towards the top of the tree. Wood from the N. and S. sides of stems did not differ significantly in m.c. M.c. was significantly greater in (*a*) stems cut in winter (62·8%) than in (*b*) those cut in summer (56·7%). The m.c. of s.w. was greater in (*b*) than in (*a*) (76·4 vs. 74·0%), but for h.w. the converse was true, m.c. being significantly greater in (*a*) (58·1%) than in (*b*) (52·8%). M.c. was not related to age or crown size. The standard deviation of each mean m.c. % is given. [Cf. *F.A.* 16 No. 4510.]

2359. Tyltin′š, K. K. Vlijanie temperatury suški na vlago- i vodopogloščenie drevesiny sosny. **[The effect of drying temperature on the absorption of atmospheric moisture and water by Scots Pine wood.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (67–74). 7 refs. [Russ.russ.] N.L.L.

Samples of Scots Pine were (*a*) air-seasoned, (*b*) kiln-dried at 50° and 80° C., (*c*) dried in petrolatum at 120° and 125°, and (*d*) dried with superheated steam at 110° and 115°. Results of absorption tests are tabulated and graphed. Absorption of atmospheric moisture increased with increasing wood density. It was on average 8% less in wood dried at 80°–110° (irrespective of drying agent) than in (*a*); absorption after (*c*) was 25% less than for (*a*). Drying temperature had little influence on water absorption, except in treatment (*c*), which reduced it by 14–33% compared with (*a*).

2360. Hodge, R. E. **The moisture content of roof timbers. Variations in heated and unheated buildings.** *Timb. Technol.* 68 (2257), 1960 (416–9, 435).

Reports the results of investigations from which it is concluded that timber seasoned to ≯20% m.c. should prove reasonably satisfactory for structural members of the roofs of unheated buildings or of multi-storeyed houses; and for well heated single-storey buildings, wood kiln-dried to 12%, or air-seasoned to ≯16% m.c. Experience indicates, however, that with the possible exception of close boarding beneath slates or tiles, no really serious troubles are likely to be encountered, even if wood of up to 20% m.c. is used.

2361. Wijesinghe, L. C. A. **The differential shrinkage of wood.** *Ceylon For.* (*n.s.*) 4 (3), 1960 (281–5). 9 refs.

A short review of various hypotheses that have been put forward to explain differential shrinkage of wood, and recent work on the subject.

2362. Eberl, W., and Gratzl, A. Quellen und Schwinden des Holzes. **[Swelling and shrinking of wood.]** *Holzforsch. u. Holzverwert.* 11 (3), 1959 (60–7). 3 refs. [G.g.e.] P.R.

A study of shrinkage phenomena, from which it is concluded that all shrinkage effects can be calculated and therefore overcome technologically. Examples are discussed.

2363. **Swelling pressures.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1959*, 1960 (9).

In tests to determine the pressures exerted by wood wetted when under restraint, those exerted by Beech blocks conditioned to 11% m.c., clamped in the tangential direction and then exposed to 20% equilibrium m.c. rose to maxima similar to those of blocks wetted in water at a slower rate. Pressures recorded with blocks of Scots Pine were less than half those for Beech, but were slightly higher for Oak than for Beech. Tests are being made to determine the effect of preliminary steaming on the pressures exerted by Beech specimens.

2364. Oberg, J. C., and Hossfeld, R. **Hydrogen bonding and swelling of wood in the dioxane-water system.** *For. Prod. J.* 10 (7), 1960 (369–72). 15 refs.

From this study, the aims of which were to determine the external volumetric swelling of specimens of *Acer saccharum* in the dioxane/water system and to consider its relationship to the physical properties of the system, data are presented illustrating a similarity of the curve representing the swelling of the wood in the system with curves representing some of the thermodynamic properties of the system under the same conditions. External swelling has a maximum value at 0·8 mol fraction water, and the relationship of swelling to total pressure and to molal dielectric polarization appears to be linear. A mechanism controlled by H bonding is offered in explanation of the wood-swelling properties of this and similar binary liquid systems [cf. *F.A.* 11 No. 2755].

2365. Stamm, A. J. **Bound-water diffusion into wood in across-the-fiber directions.** *For. Prod. J.* 10 (10), 1960 (524–8). 15 refs.

On the basis of coefficients computed for bound-water diffusion in the fibre direction [cf. *F.A.* 20 No. 5128] other coefficients for the tangential and radial directions were computed for the same 8 species, on the hypothesis that the ratios of these coefficients corresponded, at any given m.c. below fibre saturation point, to the ratios of electrical conductivity in the 3 directions. For the woods in question, these ratios varied from 0·31 to 0·53 for radial/longitudinal and 0·26 to 0·48 for tangential/longitudinal. The coefficients so computed were in good agreement with values based on the measurement of water adsorption and swelling of metal-impregnated samples (2 in. sq. and ca. ⅛ thick in the radial and tangential direction) after correction for the sometimes severe restraints on swelling in the direction ⊥ to the diffusion (the ratio of tangential to radial swelling could be as high as 27·0 when the restraint was radial and as low as 0·175 when tangential) and for the reduction of water adsorption caused by the restraints.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 1874, 2354–5, 2413.

2366. RASSUDOV, B. Novyj sposob opredelenija ob″emnogo vesa splavnyh breven. **[A new method of determining the density of floated logs.]** *Lesn. Prom.* 1960 (10), (22–3). [Russ.]

In this method, which is used e.g. for checking the density of a log at intervals during a long raft voyage, the log is lifted out of the water by a raft-mounted crane, into the lifting cable of which are set two dynamometers capable of registering up to 600 kg.; the log is then submerged by means of a sinker weight, and the dynamometer readings again recorded. Density then equals $G_1.\gamma_0/G_1 + q_1 + q_2 - Q_2$, where G_1 = log weight in the air; γ_0 = density of the water; q_1 = weight of the tackle in the air; q_2 = weight of the sinker in the water; and Q_2 = total weight of log plus sinker in the water. In practical trials during the 1959 raft season, it was found that the density of logs up to 36 cm. diam. could be determined with an accuracy of 0·15–0·2%.

2367. JAPING, H. W. Volumegewichten van een aantal houtmonsters uit Nederlands Nieuw-Guinea. **[Specific gravity of some wood samples from Dutch New Guinea.]** Landbouwhogeschool, Wageningen. 1960. pp. 24. [Du.e.*e*.]

On the basis of weighing and measuring a few samples, mainly herbarium material, and sometimes only one for each species, tabulates the mean, max., and min. sp. gr. for a very large number of species, arranged alphabetically by families. A list of families and genera is appended.

2368. FIELDING, J. M., and BROWN, A. G. **Variations in the density of the wood of Monterey Pine [*Pinus radiata*] from tree to tree.** *Leafl. For. Timb. Bur. Aust.* No. 77, 1960. pp. 28. 17 refs.

Reports on such variations in the Australian Capital Territory. Their extent within a given stand, and the relative influence of heredity and of environment in causing them, are discussed. Estimates of the heritability of density are given. Density measurements were based on cores bored from the outside of the tree to the pith, or on cores consisting of eight or nine annual rings, the density of individual rings not being studied. Consequently, the discussions refer to "average" density. Within a particular stand the size of the tree, in general, showed little relation to the density of the core extracted; wood density varied from one locality of the Australian Capital Territory to another. The stands at Blue Range, which has a moister climate than the other localities studied, tended to produce the densest wood. Within a particular locality, differences in site were not associated with important differences in density. Provenances did not show significant differences in the density of their wood. No connexion was found between wood density and any morphological characteristic of the tree. *From authors' summary.*

2369. COOPER, G. A. **Specific gravity of Red Pine as related to stem- and crown-formed wood.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (693–708). 20 refs. O.R.E.

Examination of four trees from a 36-year plantation in Iowa showed that (*a*) wood formed in the bole below the living crown was significantly heavier than (*b*) wood formed in the bole within it. When the specimens were sorted into (*a*) and (*b*), the following variables showed a very low correlation with sp. gr.: ring width or rate of growth, distance from pith, or age by ring count from pith, height of wood in tree, total age of tree when the wood was formed, seasonal precipitation means. When specimens were not sorted into (*a*) and (*b*), there was no constant relationship between sp. gr. and rate of growth or ring width; sp. gr. tended to increase with increasing distance from the pith, and decreased with increasing height. Sp. gr. bore no relationship to cardinal direction or to the number of frost-free days in the growing season. Whether wood is (*a*) or (*b*) constitutes a major factor in determining sp. gr., but it does not account for all the variation, so further study taking into account the late-wood %s of the annual rings is necessary.

2370. MURTHY, L. S. V. **Density variation in the timber of Ramin, *Gonystylus bancanus* (Miq.) Baill.** *Emp. For. Rev.* 39 (3), 1960 (324–9). 4 refs.

Material was drawn from three sites, the *padang* forest, the deltaic swamp, and the coastal swamp. Tables illustrate variations outwards, and at various distances, from the pith. Graphs are then drawn to illustrate variations in basic density, and a diagram, followed by a table, deals with %s of different tissues at different distances from the pith. The most striking difference observed was, unexpectedly, the higher proportion of fibres in the wood of the coastal swamp. *From author's summary.*

812.7. Strength Properties

See also Nos. 1874, 2354–5, 2424–5, 2507–8.

2371. SEKHAR, A. C., and NEGI, G. S. Über die Variationskoeffizienten der mechanischen Eigenschaften des Holzes. **[The coefficients of variation of the mechanical properties of wood.]** *Holz Roh- u. Werkstoff* 18 (10), 1960 (367–9). 8 refs. [G.e.] P.R.

The authors present a table showing the mean values (for 50 different Indian species not further specified) of the max., min., and mean coefficients of variation (c.v.) for the 28 most important mechanical properties. The mean c.v. for all the properties examined is 11·5%. This is compared with Australian and U.S. work, where a higher mean c.v. is found. The collection of samples from 5 trees of one species is regarded as being generally sufficient to obtain data near the true mean.

2372. SEKHAR, A. C., and RAWAT, N. S. **A note on mechanical properties of *Pinus insularis*.** *Indian For.* 86 (10), 1960 (617–20). 7 refs.

Mechanical tests were made in green and dry conditions, on standard clear specimens of *P. insularis* (*P. khasya*) from Chittagong, and the results compared with those for Teak, *P. wallichiana*, *P. radiata* and *P. roxburghii*. Strength properties were very near those of the other Pines, and inferior to those of Teak.

2373. COCKRELL, R. A. **Mechanical properties of California-grown Monterey Pine [*Pinus radiata*].** *Hilgardia, Berkeley, Calif.* 28 (7), 1959 (227–38). 8 refs. C.G.B.

Reports the mean values for several basic mechanical and physical properties of green and air-dried Monterey Pine wood as obtained from tests made on 6 California-grown trees. These values demonstrate that native Monterey Pine compares favourably in its mechanical properties with several important U.S. softwoods, especially the southern hard Pines, and also with Australian-grown Monterey Pine [cf. *F.A.* 15 No. 664]. The wood of rapid growth near the pith was consistently lighter and weaker than that farther out, and generally had wider growth rings. Otherwise there was no consistent general trend of strength with distance from the pith. There was evidence, however, of a slight decrease in strength with increasing tree height. Spiral grain was not a serious defect in the material tested except near the pith in a few specimens. The wood had shrinkage properties similar to other softwoods of comparable density. *From author's summary.*

2374. KOLLMANN, F. Die Abhängigkeit der elastischen Eigenschaften von Holz von der Temperatur. **[The dependence of the elastic properties of wood on temperature.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (308–14). 14 refs. [G.g.e.] P.R.

Using the "Elastomat", a special measuring device [not further described], tests were made on oven-dry Spruce and Oak. In the temperature range −40° to +40° C., the modulus of elasticity depended linearly on temperature (*t*). The relation between *t* and the velocity of sound in wood was also determined, and the *t*-dependence of the logarithmic decrement. Preliminary trials were also made on the dependence on *t* of the elastic constant of saturated Spruce and Oak in the range 0 to 20° C.

2375. PERKITNY, T., and STEFANIAK, J. **[Effect of simultaneous loading and moistening on the bending strength of wood.]** *Rocznik Wyższej Szkoły Rolniczej, Poznań* 1 (3), 1958 (3–14). [Pol.?] From *abstr.* in *Holz Roh- u. Werkstoff* 18 (8), 1960 (322). [G.] P.R.

In tests with Scots Pine sapwood, (*a*) loaded and then brought to a certain m.c. either by moistening or drying, (*b*) brought to the same m.c. and then loaded, (*a*) was found to have a bending strength ca. 30% less than that of (*b*).

2376. KOLLMANN, F. Zur Frage der Querdruckfestigkeit von Holz. **[Compression strength perpendicular to the grain.]** *Holzforsch. u. Holzverwert.* 11 (5), 1959 (109–21). 25 refs. [G.g.e.] P.R.

[Cf. *F.A.* 18 No. 4560.] Reviews literature on testing compression ⊥, and reports results of new experiments on sound, straight-grained Beech. Stress/strain diagrams for various moisture contents and for notched and unnotched samples are presented and discussed. Notches made no difference to results. It was found that a projection of the test pieces of only 15 mm. [beyond the bearing block] significantly improved resistance to deformation. A graph is presented of the relation of stress at constant compression to the wood m.c., and the phenomenon of failure is explained, with discussion of the microstructural processes involved.

2377. INOSE, O. **[Study on the stress-strain curve for wood in parallel-to-grain compression. I. Repetitive compression and elastic limit.]** *J. Jap. Wood Res. Soc.* 6 (3), 1960 (93–8). 4 refs. [Jap.jap. e.*e*.] P.R.

Presents experimental data indicating the elastic limit of compression ∥ (e.l.) for *Pinus densiflora*, *Cryptomeria japonica*, *Cercidiphyllum japonicum*, *Chamaecyparis obtusa*, and *Fagus crenata*. E.l. and ultimate strength (u.s.) were closely related, and the e.l./u.s. relationship appeared to be determined by wood species and not to be influenced by the m.c. of wood.

2378. BERKEL, A. Doğu lâdini (*Picea orientalis*) de Brinell sertlık denemeleri. **[Investigations on the Brinell hardness of *P. orientalis*.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (1), 1960 (16–23). 2 refs. [Turk.g.*g*.]

Samples were taken from four stems and tested at 12% m.c. End-grain hardness was 1·77–6·37 kg./sq. mm. (mean 3·7); lateral surface hardness 0·76–2·57 (mean 1·41). End-grain hardness decreased with increasing mean annual ring width from 4·75 kg./sq. mm. at 1·5 mm. to 2·92 at 6·5 mm.; it was linearly related to density.

2379. JUKNA, A. D. Novyj pribor i metod dlja skorostnogo ispytanija drevesiny. **[A new instrument and method for the rapid testing of wood.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (75–96). 2 refs. [Russ.russ.] N.L.L.

An account of the AP-1, a prototype recording apparatus that measures the resistance of wood to a cutting edge forced into it, and of tests with it. An improved version, the AP-2, is also described. The effects of wood m.c. and depth of blade penetration on the readings were determined, and nomograms constructed for correcting strength properties to 15% moisture content. It is claimed that six physical and mechanical properties of a sample can be determined in ≯20 min. vs. 14·6 hr. for Soviet standard methods.

2380. ŠUTKA, JA. Ė. Kompleksnyj metod opredelenija tverdosti drevesiny i ee pročnosti pri sdvige. **[A combined method of determining the hardness and shear strength of wood.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (97–106). 14 refs. [Russ.russ.] N.L.L.

Describes an instrument for measuring hardness and shear strength, and tests with it [woods not specified]. Results are promising.

2381. MARIAN, J. E., and STUMBO, D. A. **A new method of growth ring analysis and the determination of density by surface texture measurements.** *For. Sci.* 6 (3), 1960 (276–91). 32 refs.

Explains the use of a "Talysurf and Talymin" tracer instrument (Taylor and Hobson, Leicester, England) [cf. *F.A.* 20 No. 2542; 22 No. 973].

2382. GIORDANO, G., and CURRÒ, P. Variazione della resistenza a taglio su legno di eucalitto in funzione della temperatura. [**Variation in the shear resistance of Eucalypt wood as a function of temperature.**] *Cellulosa e Carta* 11 (8), 1960 (5–8). 2 refs. [It.f.e.g.]

[Cf. *F.A.* 21 No. 3692.] Samples of *Eucalyptus rostrata* were tested for shear strength ⊥, with temperature of samples ranging from 25 to 95° C. by 5° intervals. It was found that shear strength decreased with increasing temperature, the reduction in strength from 25 to 95° being 37%.

2383. SULLIVAN, J. D. **The effect of fatigue stress on shear in wood.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (3), 1960 (422). O.R.S.

Samples of White Fir, Western Hemlock and Douglas Fir were tested under static and fatigue loads, in shear ||, on a tangential plane. Moisture content was held constant and the sp. gr. of the wood immediately adjacent to the place of failure was measured. Results, after statistical analysis of the data, were: (1) Wood can be made to fail by fatigue loading. (2) There is a linear relationship between shear stress and sp. gr. at the line of failure for the samples tested in static shear. (3) There is a significant regression of stress level and sp. gr. at the line of failure, on the number of cycles to failure. (4) A linear relationship exists between shear stress and sp. gr. at the line of failure in wood tested by fatigue loading. (5) The early springwood offers least resistance to loading. (6) The stress level at failure, for fatigue shear samples, is less than for samples of the same species with comparable sp. gr. tested under static loads.

2384. GOULET, M. Die Abhängigkeit der Querzugfestigkeit von Eichen-, Buchen- und Fichtenholz von Feuchtigkeit und Temperatur im Bereich von 0° bis 100° C. [**Dependence of the transverse tensile strength of Oak, Beech and Spruce on moisture content and on temperature in the range 0–100° C.**] *Holz Roh- u. Werkstoff* 18 (9), 1960 (325–31). 13 refs. [G.g.e.] P.R.

Shows in tables and graphs the relationship of transverse tensile strength (both radial and tangential) of *Quercus* sp., *Fagus sylvatica* and *Picea abies* to wood m.c. and temperature. At m.c.'s <10%, the effect of temperature and r.h. on the strength (tangential) of Spruce was relatively small; in tangential Beech specimens, strength showed itself as a steadily falling function of temperature and r.h.

812.8. Workability. Working Properties

2385. **Wood machining.** *Extr.* from *Rep. For. Dep. Tanganyika 1959*, 1960 (21–2).

Gives results of tests to determine working properties of wood of *Casearia battiscombei*, *Macaranga conglomerata*, *Ficalhoa laurifolia*, *Julbernardia* [*Isoberlinia*] *globiflora*, *Cupressus lusitanica*, and *Albizzia antunesiana*.

813. Wood Chemistry

See also Nos. 2531 *et seq.*

2386. MOROZOVA, O. V., IVANOVA, R. P., and KOZLOV, V. N. Himičeskij sostav drevesiny usyhajuščih i suhih stvolov kedra korejskogo i eli ajanskoj. [**The chemical composition of the wood of dying and dead *Pinus koraiensis* and *Picea jezoensis* trees.**] *Izvestija Sibirskogo Otdelenija Akademii Nauk SSSR, Moskva* 1960 (3), (45–9). 9 refs. [Russ.] N.L.L.

Sawdust samples from dead and dying *P. koraiensis* and *P. jezoensis* were analysed. The observed range of composition [in % dry wt.; values for *P. jezoensis* in parentheses] was: ash—0·17–0·24 (0·18–0·33); ether extractables—2·34–7·34 (0·86–1·43); ethanol extractables—3·22–7·0 (1·12–2·40); hot-water extractables—4·20–6·88 (1·16–1·95); extractable in 1% NaOH—1·09–1·66 (1·05–1·80); lignin—23·41–26·98 (26·66–28·01); cellulose—39·64–46·19 (48·11–50·50); pentosans—6·18–7·34 (7·26–7·67); methoxyl groups in the lignin—15·03–16·39 (15·61–16·79); galactans—0·81–1·73 (0·69–1·05); mannans—(easily hydrolysed) 5·26–6·73 (6·12–6·95), (difficult to hydrolyse) 13·41–15·84 (13·88–16·46); polyuronic acids—2·21–3·43 (2·07–3·34); polysaccharides—(easily hydrolysed) 10·97–11·74 (8·65–10·0), (not easily hydrolysed) 30·08–38·93 (33·36–37·27). The composition of the wood of dead and dying trees of both species differed only slightly from that of wood from healthy trees; such wood could be used for pulp and paper manufacture, hydrolysis, etc.

813.1 Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 1356, 2329, 2364, 2413, 2481.

2387. FREUDENBERG, K., and FRIEDMANN, M. Oligomere Zwischenprodukte der Ligninbildung. [**Oligomeric intermediate products in lignin formation.**] *Chem. Ber.* 93 (9), 1960 (2138–48). 21 refs. [G.g.] P.R.

Presents the constitutional formulae of a trimeric and a tetrameric ether-like substance previously isolated after interrupted dehydrogenation of coniferyl alcohol, and discusses the principles involved (addition of certain phenols to a quinone methide radical). The addition principle is considered to be the second formation principle (the first being condensation) in lignin formation and to explain the branching of the lignin molecule.

2388. BUSCHE, L. R. **The Klason lignin determination as applied to Aspenwood with special reference to acid-soluble lignin.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (1), 1960 (34). 1 ref. O.R.S.

2389. BHATTACHARYA, A., and SCHUERCH, C. **Lignin from the alkaline hydrogenation of Sugar Maple wood. III. Chromatographic separation of higher molecular weight fractions and a structural**

study. *Tappi* 43 (10), 1960 (840–4). 10 refs. P.R.

[Cf. *F.A.* 21 No. 985.] From the results obtained, the column chromatographic method developed for the separation of monomers and higher molecular-wt. material from the ether-soluble phenolic fraction of hydrogenated lignin, appears to be sufficiently reproducible for use in studying changes in lignin products with variations in the reaction conditions and wood source, and in separating some individual compounds from the product mixture.

2390. Kratzl, K., and Gratzl, J. Zur Theorie der Hydrolyse und Kondensation des Lignins. **[On the theory of the hydrolysis and condensation of lignin.]** *Holzforsch. u. Holzverwert.* 12 (1), 1960 (8–14). 24 refs. [G.g.e.] P.R.

A study of the behaviour of lignin obtained by a new process (Rheinau) after thermal pretreatment and subsequent oxidation with nitrobenzene in alkali.

2391. Goring, D. A. I., and Timell, T. E. **Molecular properties of a native wood cellulose.** *Svensk PappTidn.* 63 (16), 1960 (524–7). 21 refs. [E.e.sw.g.] P.R.

Results of light-scattering measurements on a cellulose nitrate of *Betula papyrifera* corroborated those from viscosity measurements and were similar to those from a light-scattering study of a nitrated native ramie cellulose. It is concluded that the cellulose in *B. papyrifera* has the same molecular size as that in native cotton or ramie celluloses. The molecular weight of the cellulose is about 20 times that of the xylem constituent of *B. papyrifera*. *From authors' summary.*

2392. McKenzie, A. W., and Higgins, H. G. **Heterogeneous acid hydrolysis of cellulose in the presence of pentosans**. *Svensk PappTidn.* 63 (16), 1960 (530–4). 15 refs. [E.e.sw.g.] P.R.

Discusses the reactions of straw and *Eucalyptus regnans* holocelluloses and of cotton when subjected to acid hydrolysis.

2393. Zajceva, A. F., *et al.* Dul′cit iz arabogalaktana listvennicy. **[Dulcitol from *Larix gmelinii* arabogalactan.]** *Ž. prikl. Him.* 32 (3), 1959 (690–3). 4 refs. [Russ.] P.O.

Presents results of experiments on hydrogenation of arabogalactan extracted from *L. gmelinii* after additional hydrolysis, in order to determine the dulcitol yield in relation to the pressure and time of catalyst operation. At a hydrogenation temperature of 120° C. and 150 atm. the yield of crude dulcitol in the first 36 hr. of continuous catalyst operation was >97% (calculated on the wt. of the original reducing substances).

2394. Timell, T. E. **Studies on *Ginkgo biloba*, L. 1. General characteristics and chemical composition**. *Svensk PappTidn.* 63 (19), 1960 (652–7). 16 refs. [E.e.sw.g.] P.R.

Its phylogeny and general characteristics are briefly reviewed. A study of major branches from a ♂ and a ♀ tree showed that in wood structure and in the chemical composition of wood and outer and inner bark, *G. biloba* is very similar to most conifers. The chemical composition of the woods of the two trees was very similar; they contained ca. 41% cellulose, 33% lignin and 26% hemicelluloses. The predominant hemicelluloses are glucomannan (or perhaps a galactoglucomannan) and an arabino-4-O-methylglucuronoxylan.

2395. Jabbar Mian, A., and Timell, T. E. **Studies on *Ginkgo biloba*, L. 2. The constitution of an arabino-4-O-methylglucuronoxylan from the wood**. *Svensk PappTidn.* 63 (21), 1960 (769–74). 32 refs. [E.e.sw.g.] P.R.

The xylan was obtained in a 4-% yield. Its structure has been established and is identifical with that in the majority of conifers.

2396. Banerjee, S. K., and Timell, T. E. **Constitution of an arabino-4-O-methylglucuronoxylan from the wood of an Eastern White Pine (*Pinus strobus*, L.)**. *Tappi* 43 (10), 1960 (849–57). 74 refs. P.R.

Reviews previous work on the main polysaccharides of *P. strobus*, and examines in particular the constitution of the xylan, especially the mode of attachment of its arabinose groups and the degree of branching and molecular size of the polysaccharide, properties not yet definitely established for any of the few softwood xylans so far investigated.

2397. Jabbar Mian, A., and Timell, T. E. **Isolation and properties of a 4-O-methylglucuronoxylan from the inner bark of White Birch (*Betula papyrifera*)**. *Tappi* 43 (9), 1960 (775–81). 76 refs. P.R.

The 4-O-methylglucuronoxylans present in the wood and bark of *B. papyrifera* were found to be almost identical.

2398. Timell, T. E. **Isolation and properties of a glucomannan from the wood of White Birch (*Betula papyrifera*, Marsh.)**. *Tappi* 43 (10), 1960 (844–8). 41 refs. P.R.

[Cf. *F.A.* 21 No. 4921.] Briefly discusses the problems encountered in the isolation of glucomannan from *B. papyrifera*. Most of the mannose residues were found to originate from a glucomannan containing glucose and mannose residues in the ratio 1/1·1, the conclusion being that the glucomannan is an essentially linear (1→4)-linked diheteroglycan containing roughly equal amounts of β-*D*-glucose and β-*D*-mannose.

2399. Meier, H. **On the mannan hemicelluloses in coniferous and deciduous woods.** *News Bull. Int. Ass. Wood Anatomists* 1960 (2), (2–3). 9 refs.

A review of literature.

813.2. Minor Organic Constituents. Extractives

See also Nos. 2344, 2597.

2400. Colombo, P., *et al.* **A solvent for qualitative and quantitative determination of sugars [in wood] using paper chromatography.** *Journal of Chromatography, Amsterdam* 3 (4), 1960 (343–50). 9 refs. O.R.S.

A rapid and precise method for the separation of the principal monosaccharide constituents of the carbohydrate fraction of wood was sought. A solvent composed of a mixture of ethyl acetate, pyridine and water in the proportions 3·6/1/1·15 gave complete separation of the sugars and allowed both qualitative and quantitative determinations.

2401. Back, E. **On the relative composition of canal resin and ray parenchyma resin in *Picea abies* (Karst.) stemwood. The resin in parenchymatous cells and resin canals of conifers. IX.** *Svensk PappTidn.* 63 (19), 1960 (647–51). 62 refs. [E.e. sw.g.] P.R.

The canal resin proved to contain most of the free fatty and resin acids, with some esters, and the parenchyma resin to contain unsaponifiable resin components and some esters. The importance of this distribution for the alkaline deresination of chemical pulp is discussed. Data on the extractable resin of Pine and Birch chips and chipping sawdust confirm that the resin concentrated in the chipping sawdust is canal resin [cf. *F.A.* 17 No. 841].

2402. **Natural durability of timber: a toxic extractive from Indian Rosewood.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1959*, 1960 (31).

Agar tests were made on a polyphenol occurring in the heartwood of the very durable *Dalbergia latifolia.* It was found to be very toxic, concentrations of 0·03% sufficing to prevent the growth of wood-destroying fungi.

2403. Sandermann, W., and Dietrichs, H. H. **Chemical studies of tropical woods. Part 4. Chemical investigation of Teak wood.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4875, 1960. pp. 22 + 4 photos, 2 dgms., 8 gphs., 4 tbls. 46 refs. Transl. by E. Feigl from *Holzforschung, Berlin* 13 (5), 1959 (137–48). [See *F.A.* 21 No. 3713.] Limited distribution.

2404. Hasegawa, M., and Shirato, T. **Abnormal constituents of *Prunus* wood: Isoolivil from the wood of *Prunus jamasakura*.** *J. Jap. For. Soc.* 41 (1), 1959 (1–3). 5 refs. [E.e.jap.]

A good yield of isoolivil and a poor yield of flavonoids were obtained from *P. jamasakura* wood attacked by *Coriolus* [*Polystictus*] *versicolor.* Isosakuranin and isosakuranetin, present in normal healthy wood, were totally lacking.

2405. Orth, H. Die Isolierung der Inhaltsstoffe von *Tabebuia flavescens* durch Extraktion. **[Isolation of extractives of *T. flavescens*.]** *Holzforschung, Berlin* 14 (3), 1960 (89–91). 8 refs. [G.g.e.] P.R.

Describes extraction with acetone, petroleum ether, steam (distillation), and alkali extraction followed by steam distillation. Lapachol and lapachenol were isolated.

2406. Larsson, S. E., and Selleby, L. **Aspen wood constituents.** *Svensk PappTidn.* 63 (18), 1960 (606–8). 7 refs. [E.e.sw.g.] P.R.

An examination of extracts of wood of *Populus tremula* showed the presence of *myo*-inositol, glucose, fructose, sucrose, raffinose, stachyose and rhamnose. The lipophilic fraction was composed of ⅓ unsaponifiable material and ⅔ glycerides of fatty acids and free fatty acids. The fatty acids were fractionated and the fractions analysed by gas/liquid chromatography; their compositions are shown in tables.

2407. Harrocks, J. A. **An investigation of the neutral materials in the benzene extract of Aspen-wood.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (1), 1960 (53). 1 ref. O.R.S.

The relatively large amounts of extractives or resins in the wood, not easily removed during pulping or bleaching, may later cause such problems as pitch or loss of absorbency. Little is known of the nature of these resins, and this thesis investigates the neutral portion of the benzene extract of *Populus tremuloides.*

813.3. Ash Constituents

See also No. 1395.

2408. Pierron, P. Le zinc et le cuivre dans le sapin et le pommier en fonction de la nature du sol. **[Zinc and copper in Silver Fir and Apple in relation to the nature of the soil.]** *Annales agronomiques, Paris* 9 (6), 1958 (713–7). 8 refs. [F.f.e.g.russ.] O.R.E.

[Cf. *F.A.* 19 No. 2688.] The wood and bark of Fir contain quite high concentrations of Zn, increasing with soil acidity. Cu content is unrelated to soil pH. Zn and Cu contents of needles showed a high degree of constancy. Zn and Cu contents were lower in Apple than in Fir, but the same trends were apparent.

814. Natural Durability. Old Wood. Fossilized Wood

See also sections 844 and 845, and No. 2402.

2409. Rudman, P. **Methods of testing durability. Part 1. Field tests.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 268, 1960 (1–3).

Briefly discusses the usefulness of field, "graveyard", and "service" tests in studying the biological and physical resistance of different timbers, emphasizing the essentially long-term nature of such tests. However, though some 25 years may be needed to obtain full detailed information on minor differences between timbers, it is possible in most cases to make use of data as they become available throughout the tests.

2410. Fougerousse, M. Durabilité naturelle du bois. **[The natural durability of wood.]** *Bois For. Trop.* No. 73, 1960 (43–56). [F.e.span.]

Discusses the main agents of destruction (fungi, termites, borers) and the conditions favouring their activity. Several utilization categories are defined, and the tropical species most suitable for use in the absence of preservative treatment are indicated for each category.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 2347–8, 2350, 2357–8, 2368–70, 2373, 2524, 2531, 2541.

2411. Hale, J. D. **The definition of normal characteristics of variable timber species.** *Abstr.* in

Proc. 9th Int. Bot. Congr., Montréal Vol. 2, 1959 (148). O.B.D.

A method is outlined whereby, when sampling trees to appraise wood quality, the properties of different species may be shown in the form of graphs indicating the normal patterns of variation brought about in wood by age and environment. Species are sampled in areas of recognizable ecological type (i.e. site) so as to obtain trees representing the range of diameters in each significant age class in the forest area. Properties of the wood (e.g. sp. gr. or cell dimension) are traced throughout the stem by stem analysis so that trends of variation may be charted by position in the tree. Average properties representing whole stems may also be plotted as ordinates against diam. classes in order of magnitude as abscissae. Every species may therefore have a group of curves as "norms" for each site, each curve representing variation in sp. gr. among small to large diameters, in the same age class. Trees having significantly high or low sp. gr. for their class are singled out for anatomical observation to determine whether exceptional qualities result primarily from exceptional environment or exceptional inheritable characteristics. Use of such analysis is suggested to distinguish trees with superior characteristics able to be propagated by inheritance.

2412. RENDLE, B. J. **Research on juvenile wood in Britain and its significance for forest tree improvement.** *Proc. 7th Ntheast. For. Tree Impr. Conf., Burlington, Vt. 1959*, 1960 (21–4).

2413. CECH, M. Y., KENNEDY, R. W., and SMITH, J. H. G. **Variation in some wood quality attributes of one-year-old Black Cottonwood [*Populus trichocarpa*].** *Tappi* 43 (10), 1960 (857–9). 12 refs. P.R.

To determine the effects of growth rate, heredity, and site on fibre length, sp. gr., and holo- and α-cellulose content in *P. trichocarpa*, 15-in.-long samples from one-year-old trees were cut at 5–15 in. above the ground and divided into 3 groups according to their origin. Growth rate proved to have a statistically significant effect on fibre length and sp. gr. Faster growth was correlated with longer fibres and lower sp. gr. Clonal source influenced sp. gr. independently of growth rate, and cellulose content was variable, but not associated with any of the factors tested.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

2414. VOSKRESENSKII [VOSKRESENSKIJ], S. A. **Wood cutting.** Department of Scientific & Industrial Research, London. 1960. pp. vii + 131 + many photos, dgms. & gphs. 23 refs. Translation by F. Lachman and M. E. Suino of "*Rezanie drevesiny*", published by Goslesbumizdat, Moscow & Leningrad, 1955. I.F.B.

A theoretical, detailed study, containing the following chapters: Basic data on the cutting process; Elementary cutting; Sharpness and durability of the tool; Interaction between cutter and wood; General problems of chip formation during the cutting of a homogeneous, isotropic material; Chip formation during the cutting of wood across the grain; Chip formation during wood cutting along the grain; Chip formation in end-grain cutting of wood; The effect of various factors on the cutting force.

2415. MCKENZIE, W. M. **Fundamental aspects of the woodcutting process.** *For. Prod. J.* 10 (9), 1960 (447–56). 18 refs.

After preliminary tests showing that cutting speed affected cutting forces and surface quality little or not at all, the effect of various factors (species properties, moisture content, cutting angle, sharpness etc.) were studied, chiefly in a slow (0·5 in./min.) experimental orthogonal cutting operation, with the cutter edge || to the work piece and ⊥ to the velocity vector, and both edge and vector ⊥ to the grain. The theory of a beam on an elastic foundation proved a helpful model in the development of equations for predicting the types of surface failure in relation to bending strength and elastic moduli (factors strongly influenced by m.c.) etc. and for the study of the complex, first indentation phase of cutting in cellular material. Small-scale tests indicated that surface qualities could be improved both by lateral oscillation of the cutter edge and by lubrication.

2416. Österreichs Holzmesse. **[Austria's wood fair.]** *Holz-Zbl.* 86 (112), 1960 (1567–8). [G.]

Includes a brief description of (1) annular-sawn woods [cf. *F.A.* 21, Austria p. 686]; (2) a new type of flooring consisting of thin short pre-dried pieces of hardwoods or softwoods glued together to form tongued and grooved boards 21 mm. thick, thus combining the ease of laying of floor boards with the dimensional stability of parquet and, because the softwood pieces are glued together along the grain, with their cross-sections as the wearing surface, great durability; and (3) a novel Austrian bandsaw running on rails, which is fitted with a double-cutting blade. The two models, for logs 75 and 100 cm. in diameter, cost DM. 16,000 and 23,000 respectively.

821. Barking

See No. 1906.

822. Saws and Sawing

See also No. 2438.

2417. THUNELL, B. Neuere Untersuchungen über die Vorschubbewegung des Blockes in Vollgattern mit stetigem Vorschub. **[Recent investigations on the feed movement of the log in frame saws with continuous feed.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (314–7). 3 refs. [G.g.e.] P.R.

Reports detailed studies on water-stored Scots Pine logs sawn in a 7-blade frame saw (350 rev./min., stroke 600 mm.) showing that the log is braked and accelerated twice during each complete movement of the frame. This process becomes clear if one observes not only the course of contact between tooth tip and kerf bottom but also the direction of log movement, which governs the length of this contact. As the teeth are only partly free-cutting (i.e. only some travel right through the log), unejected chips etc. form a more or less compressed cushion between saw-blade and log. This cushion transmits forces that are big enough to influence the condition of movement and to act in concert with the frictional forces.

2418. Fonkin, V. F., Ioffe, A. I., and Ajzenberg, A. I. Avtomatizacija upravlenija lesoramami. **[Automated control of frame saws.]** *Lesn. Prom.* 1960 (9), (23–5). 1 ref. [Russ.]

Describes a control system developed by SibNIILHĖ and installed at the Maklakovo timber mill, near Krasnoyarsk. Automation has increased output by 15%, and output per worker 1·7- to 2-fold.

2419. Johnston, J. S. **Developing an experimental two-piece circular saw blade.** *For. Prod. J.* 10 (9), 1960 (443–6). 5 refs.

Describes early tests with an experimental blade, in which a rim, ca. 2 in. wide, cut from a 30-in. diam., 36-tooth, 10-gauge blade was joined to a thinner, flat (i.e. not tensioned) centre by rivets in slotted holes allowing radial movement. This enabled the rim to expand in response to the thermal stresses set up by sawing without a pre-tensioning of the centre section. The greater tangential tensile stress in the rim, due to centrifugal forces, stiffened the blade, suggesting the possible use of thinner blades [cf. *F.A.* 21 No. 3734]. Performance of the experimental blades in test cuts at 1270 rev./min. with a feed speed of 110 ft./min. was similar to that of a standard blade ($\frac{1}{16}$ in. variation in board thickness).

2420. Nejland, G. K. O sravnitel′noj vygodnosti primenenija kruglopil′nyh s koničeskimi pilami i lentočnopil′nyh stankov v uslovijah tarnogo proizvodstva. **[Comparative suitability of using swage saws and bandsaws for the production of box shooks.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (223–34). 3 refs. [Russ.russ.] N.L.L.

Lists the specifications and compares the performance of (1) the Beronius Eskilstuna swage saw and (2) the Jonsereds bandsaw. In output, accuracy, surface smoothness, and power consumption, (1) proved generally superior to (2) for boards ≯153 mm. wide and ≯19 mm. thick, and the labour requirement was also less for (1). With bigger boards, (2) was generally superior to (1).

2421. **Use of the small bandsaw.** *Timb. Tr. J.* 235 (4387), 1960 (79, 81).

A general article on methods used in N. America for producing curved and intricate shapes by means of the narrow-bladed bandsaw (scroll bandsaw), describing the machine and various techniques employed in its use.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also No. 1892.

2422. Schilkrut [Šilkrut], D. I. **[Mechanical vibrator with independent regulation of amplitude and frequency.]** *Vestnik Mašinostroenija* 38 (6), 1958 (63–4). [Russ.] From *abstr.* in *Holz Roh- u. Werkstoff* 18 (10), 1960 (406). [G.] P.R.

Describes a vibratory cutting head with vertical, horizontal, rotatory and oscillatory movements at speeds up to 14,000 oscillations/min. It is designed for moulding operations in the woodworking industry.

2423. Pižurin, A. A. O čistote poverhnosti pri točenii drevesiny. **[Surface cleanness in turning wood.]** *Derev. Prom.* 8 (9), 1959 (18–20). 1 ref. [Russ.] P.R.

An investigation of the effect of a number of factors (e.g. clearance angle, feed speed, diam. of workpiece, wood m.c., etc.) on surface cleanness, when turning Birch longitudinally with the cutter parallel to the axis of the piece, and when turning with a tangentially disposed cutter having a cross or transverse feed.

824. Forms of Joint. Jointing and Assembly

See also No. 2446.

824.1. Nailed Joints

See also No. 2309.

2424. Mack, J. J. **Grooved nails.** *Aust. Timb. J.* 26 (8), 1960 (43–44, 46, 50, 131). 3 refs.

Compares the static withdrawal resistance of plain and grooved nails in green and air-dry Radiata Pine and Eucalypts after various periods. Grooved nails are superior, in both softwoods and hardwoods, in both immediate and delayed withdrawal resistance. They also have less tendency to "pop".

2425. Mack, J. J. **The strength of nailed timber joints. I. In Messmate Stringybark [*Eucalyptus obliqua*].** *Div. For. Prod. technol. Pap. For. Prod. Aust.* No. 9, 1960. pp. 26 + 3 plates. 15 refs.

Describes tests to determine the effects of several variables on the lateral strength of 3-member nailed joints of green *E. obliqua*. Joints tested after drying sustained 30% higher max. loads than those tested green, but the effect of m.c. at test on the load at 0·015 in. slip was negligible. A close relation was observed between the strengths of the joints and nail diam., regardless of timber thickness. Several formulae for predicting the strength of nailed joints from basic properties of the materials gave good results. *From author's summary.*

824.8. Glues and Gluing

See also Nos. 2441–4.

2426. Renaud, R. E. **Evaluation of glue line quality by block shear, plywood shear and cross-lap test specimens.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (713–30). 11 refs. O.R.E.

A detailed report of tests on the 3 types of specimen, glued with urea-formaldehyde, resorcinol formaldehyde, and polyvinyl resin. The standard glue block-shear specimen (made of *Acer saccharum* blocks $1\frac{3}{4} \times 2$ in., glue-line area 3 sq. in.) appeared to provide the best evaluation of glue-line quality.

2427. Northcott, P. L., and Colbeck, H. G. M. **Prediction of plywood bond durability.** *For. Prod. J.* 10 (8), 1960 (403–8). 9 refs.

In tests on Douglas Fir plywood, glued with phenolic resins of 4 strength values [cf. *F.A.* 18 No. 968], a correlation was found between strength reduction (in terms of breaking load and wood failure) after up to 20 successive cycles of boiling and drying and exposure of up to 56 months. A graphical method of predicting the service life of a new type of plywood from accelerated weathering tests is given.

2428. Clad, W. Die Beurteilung von Harnstoff-Harzleimen auf Grund ihrer Prüfung. **[Evaluation of urea resin glues on the basis of tests.]** *Holz Roh- u. Werkstoff* 18 (10), 1960 (391–400). 64 refs. [G.g. e.] P.R.

Discusses properties, problems in testing, various results from long- and short-term tests (laboratory and field), the testing of glued constructional units, and their practical use. It is concluded that urea-resin glues can be used wherever they are protected from direct weathering.

2429. Blomquist, R. F., and Olson, W. Z. **An evaluation of 21 rubber-base adhesives for wood.** *For. Prod. J.* 10 (10), 1960 (494–502).

In tests on Yellow Birch veneers, rubber adhesives of the solution, emulsion, and mastic types proved generally much inferior in strength and durability to 5 other glues used as controls, and took much longer to develop full strength. They did, however, develop some strength immediately at room temperature and they were superior to controls in load-sustaining ability at 90% r.h.

2430. Ropella, L. A. **Gluing fire-retardant treated wood.** *For. Prod. J.* 10 (10), 1960 (513–5).

Discusses the problems involved in preparing fireproofed wood for bonding, and results of tests with 9 adhesives. The hot-press method of bonding is considered best. Greatest durability was obtained with resorcinol and phenolic adhesives. Melamine and, in many cases, melamine-urea resins were also suitable. *From author's summary.*

825. Cleaving. Adzing. Mechanical Comminution

See also Nos. 1892, 2296, 2574.

2431. Piponius, A. Finnische Holzhackmaschinen. **[Finnish hogs.]** *Holz Roh- u. Werkstoff* 18 (9), 1960 (356–7). [G.] P.R.

A brief illustrated description of 6 Finnish machines of various design.

2432. Licman, É. P. Teoretičeskoe issledovanie voprosa polučenija ščepy na barabannoj rubitel′noj mašine. **[Theoretical study of chipping with a drum-type hog.]** *Gidrol. lesohim. Prom.* 13 (3), 1960 (6–9). [Russ.] P.R.

A theoretical study of the factors affecting chip dimensions (in the production of chips for the pulp-and-paper and hydrolysis industries), viz. the effect of drum diameter on chip length along the grain; the effect of the feed angle and the position of the bottom knife on chip quality; the effect of the length of the projecting part of the knife on chip quality. Tables and formulae determining these relationships are presented.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See Nos. 2307–8.

827. Bending. Moulding (other than by Cutting)

2433. **Wood bending: solid bending.** *Extr.* from *Rep. Dir. For. Prod. Bd., Lond. 1959*, 1960 (9–10).

The steam-bending properties of Ash were examined and further standard tests made on *Guibourtia arnoldiana*, *Khaya anthotheca*, *Quercus cerris*, and 4 U.K. softwoods [cf. *F.A.* 21 No. 1049]. The standardized method of softening bentwood by steam and setting it in a heated chamber was generally preferred to the R.F. heating method, though bends of large radii of curvature appeared to set better in the R.F. field than in the heated room.

829.1. Finishing

2434. Fuchs, F. R. Die Beschichtung von Holzwerkstoffen mit Kunstharzfolien und -filmen. **[Overlaying wood-based materials with synthetic resin films.]** *Holzforsch. u. Holzverwert.* 11 (6), 1959 (136–40). 7 refs. [G.g.e.] P.R.

A description of the properties of the raw materials (synthetic resins, papers, etc.), the production of the films, and various methods of overlaying.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 1896, 2297, 2457, 2468.

2435. Saphasri, B. **[Fuelwood problems in connexion with tobacco curing in Chiangmai forest division.]** *Vanasarn* 17 (4), 1959 (21–30). [Siam.e.]

Discusses the management problems involved in implementing a recently sanctioned plan for supply by the forest department of fuelwood to the State Tobacco Monopoly Co.'s curing centres at Chiangmai and Muang Lamphum.

2436. Ishaq, S. M. **The use of timber in coal mines.** *Pakistan J. For.* 10 (2), 1960 (127–32).

An account of the types and dimensions of timber (mainly *Acacia arabica* and *Populus euphratica*) used in the coal mines of Baluchistan, consumption, supplies, and the need for plantations to ensure a sufficient supply.

2437. Schmitz, A., Fouarge, J., and Roosen, P. Les bois de mine du Haut-Katanga. **[The mine timbers of Haut-Katanga.]** *Bull. Soc. For. Belg.* 67 (10), 1960 (325–58 + 12 photos). 9 refs. [F.]

Discusses the available supplies, tabulates test data on a number of native and exotic species, and concludes that Eucalypt plantations are economically and technically the most promising source of future supplies.

832. Mills, Their Functions and Products

832.1. Sawmills and Planing Mills

See also Nos. 2417–21.

2438. Carlberg, R. **Frame saw capacity and the organization of edging.** *Transl. N.Z. For. Serv.* 1960. pp. 5. Smry. Transl. from *Pap. ja Puu* 41 (11), 1959 (561–4). [See *F.A.* 21 No. 2409.] Limited distribution.

2439. Mørk, B. Produksjonskostnaderne ved en rekke norske sagbrukstyper sett i forhold til varierende årsproduksjon. **[Production costs for a number of Norwegian sawmill types in relation to varying annual production.]** *Extr.* from *Årsberetn. Norsk Tretekn. Inst. 1959*, 1960 (13–8). [Nor.]

Costs for the commonest types (double circular saw, heavy and light circular saws, double edgers, etc.) for annual outputs of up to 6000 standards are shown in a graph.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 2297, 2307–9, 2426–30, 2446, 2452, 2470, 2561.

2440. Koenigsberg, E. **Applying linear programming to the plywood industry.** *For. Prod. J.* 10 (9), 1960 (481–6).

Includes examples of computations to obtain the best, most profitable combination of products from a given set of logs, or to ensure the purchase of the best combination of logs for a given production programme, etc.

2441. **Plywood automation.** *For. Prod. J.* 10 (8), 1960 (392–402).

A panel discussion including: Automation with dry-film adhesives (*R. K. Stensrud*) [involving the use of pre-dried phenol-formaldehyde resins supported on a cellulosic carrier]; Economics of automation (*C. A. Herstrom*); Continuous layup systems (*R. A. Sullivan*); and Wet-web glue lines (*H. M. Preusser*) [reduction of labour costs through mechanical panel layup and the use of fast-pressing, high-molecular-weight waterborne adhesives applied wet to a carrier sheet or web].

2442. Yamagishi, Y., and Okada, M. **[Surface checking of plywoods. II. Effects of pressing condition and thickness of veneers for the surface checking of plywoods.]** *J. Jap. Wood Res. Soc.* 6 (4), 1960 (152–7). 2 refs. [Jap.jap.e.*e.*] P.R.

Discusses the effects of pressing, veneer thickness, and core veneer quality, on the surface checking ∥ to grain of *Tilia japonica* and *Kalopanax septemlobum* plywoods. Evidence of swelling and shrinkage of the core layer as a cause of checking in the face veneer is presented; surface checks and even delamination occur especially when the face veneers are thinner than the core. Owing to the presence of large vessels, causing irregular shrinkage, *K. septemlobum* was particularly prone to checking after pressing, but generally the effects of veneer thickness, the method of plywood assembly, and the quality of core veneers were just as potent as that of pressing.

2443. Currier, R. A. **Compression of white-pocket veneer in hot-pressed Douglas-Fir plywood.** *For. Prod. J.* 10 (8), 1960 (409–15). 13 refs.

Tests with veneers showing three degrees of *Fomes pini* decay indicated that under normal conditions of pressing (7 min. at 175 lb./sq. in.), compression (before recovery) could reach $>20\%$ of initial thickness in the poorest grade. When pressure was controlled [cf. *F.A.* 13 No. 63] after the first 2½ minutes, compression could be reduced to controlled limits (here 13% in grade 3) without materially affecting glue-line strength. All grades conformed to delamination standards for interior plywood. [Cf. *F.A.* 20 No. 3761.]

2444. Heebink, B. G. **A new technique for evaluating show-through of particle board cores.** *For. Prod. J.* 10 (8), 1960 (379–88).

A grid is projected on to the finished panel to show up differences in reflection caused by unevenness in the core. Among the many variables tested, the use of fines on the surface, very little sanding and special sanding techniques, and the use of a ⅛-in. hardboard crossband (but not a typical veneer crossband) improved surface quality. Thick flakes and slivers reduced it.

832.3. Match Factories

2445. Dey, A. C., and Ramaswami, S. **Indian woods tested for match manufacture.** *Indian For. Bull.* (*n.s.*) No. 203, 1960. pp. 41. Price *Rs.* 2.37 (4*s.*).

Revision of a bulletin published in 1936. Species tested now total 93.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also Nos. 2309, 2360, 2416, 2560–2.

2446. Möhler, K. Die Weiterentwicklung des konstruktiven Holzbaues durch die Holzforschung. **[Further development of design in wooden constructions through research.]** *Holzforsch. u. Holzverwert.* 12 (3), 1960 (41–50). 6 refs. [G.g.e.] P.R.

Discusses the main areas of research in the development of wooden supporting structures, especially the effect of time on strength, the flexibility of connecting materials, glue joints and glulam construction, finger jointing, etc.

2447. Bacher, F. Das Stehvermögen von glatten Türen mit Pressplatten bei laboratoriumsmässiger Prüfung und im praktischen Einsatz. **[Stability of flush doors [against warping] under laboratory testing and in practical use.]** *Holzforsch. u. Holzverwert.* 12 (2), 1960 (22–30). 6 refs. [G.g.e.] P.R.

The warping resistance of flush doors is considered in relation to bulging or buckling of the panels themselves, or twisting (springing etc.) of the whole frame. These influences are examined in detail and recommendations made for the Austrian door industry.

2448. FERREIRINHA, M. P. Madeiras africanas para pavimentos. **[African timbers for flooring.]** *Repr.* from *Agros* 42 (4), 1959 (269–86). 11 refs. [Port.]

Discusses the characteristics of woods suitable for flooring and lists 30 species from Portuguese Africa, with recommendations as to the kind of flooring for which they are suitable. Brief notes on conversion and seasoning are included.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 2420, 2505.

2449. **Boom for wooden stillages.** *Timb. Tr. J.* 235 (4391), 1960 (68).

Stillages consisting of a pallet on three 2 × 2-in. runners with a board cover, for packaging 20–30 cwt. of tin-plate sheet, have to withstand 10 tons weight in the stack. Of 360 sizes used, most lie in the length and width range of 28–35 × 21–28 in. Canadian Yellow Birch is favoured for this purpose, because of its high impact strength and moduli of rupture and elasticity.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

2450. RAO, K. R. **Pencils from Bamboo.** *Indian For.* 86 (9), 1960 (566 + 9 photos).

Describes a method of using Bamboo [unspecified] for the making of pencil slats, with simple equipment suited to a cottage industry. Blind men have been trained to do this job without any difficulty.

836. Furniture and Cabinet-Making. Ecclesiastical Woodwork. Carving. Marquetry. Wooden Ornaments

2451. MUNZ, W. Teakholz-Verarbeitung. **[Working Teak.]** Verlag und Holzfachbuchdienst Holz, Merling b. Augsburg. 1960. pp. 74. [G.] Price *DM.* 12. From review in *Holzforschung, Berlin* 14 (4), 1960 (128). [G.] P.R.

A practical manual intended for furniture manufacturers using Teak.

838. Vehicles (including Ships, Boats, Aircraft)

2452. SCHÖNHERR, H. Buchensperrholz für den Bau von Güterwagen. **[Beech plywood for freight wagons.]** *Holz-Zbl.* 86 (130), 1960 (1821–3). 1 ref. [G.]

Discusses specifications for, and six years' practical experience with, Beech plywood used on the W. German railways for the sides of wagons. This has generally given good service. To prevent cracks in the resin-impregnated paper overlay finish, hardboard as the outer ply appears promising. Since some plywood panels showed signs of decay, all are now treated with an oily preservative added to the glue mixture.

839.2. Wood Flour and its Manufacture

2453. VORREITER, L. Die Erzeugung von Holzschrot. **[The manufacture of *Holzschrot*.]** *Holztechnik* 40 (7), 1960 (298–9). 4 refs. [G.] P.R.

A general account, including descriptions of two patented German methods. *Holzschrot* consists of small cubes of wood, with an edge length of 1–10 mm. and is used for special purposes, e.g. as an absorbent or a mild abrasive.

2454. VORREITER, L. Das Holzmehl, seine Eigenschaften, Erzeugung und Verwendung. **[Wood flour, its properties, manufacture and uses.]** *Holz-Zbl.* 86 (124; 127; 130), 1960 (1734–6; 1791–4; 1828–9). 52 refs. [G.]

Part I covers types and properties (particle shapes and sizes, colour, weight, pH, flammability etc.), Part II, manufacture (raw materials—mostly sawdust and chips from cutting, planing, grinding, etc.), and Part III, mill lay-out (including safety and costs) and utilization (including various composite materials, glue extenders, sanding and polishing, etc., and mentioning also the use of wood flour in place of liquid fuel in an internal-combustion engine, the final development of which was interrupted by the war.

2455. SHULMAN, J., and WILNER, B. L. **New uses for wood flour in rigid polyurethane foams.** *For. Prod. J.* 10 (10), 1960 (487–90).

Describes preliminary work indicating that, by adding wood flour to polyurethane foams, substances of low density, suitable for many uses, can be made at lower cost. It is thought that the wood actually takes part in the reactions and becomes an integral part of the polymer chain.

839.8. Industrial Waste Wood, its Processing and Uses

See Nos. 1757, 2401, 2545, 2567–8, 2576.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 1891, 2079, 2307, 2335, 2490, 2548, 2557.

2456. SMEAL, T. W., and LEACH, S. W. **A new method for studying the weathering of creosote.** *For. Prod. J.* 10 (10), 1960 (509–11).

The changes occurring in test stakes during exposure were studied with the help of a new technique for determining evaporation patterns of very small samples. After 10 years, mean retention in a typical stake had dropped from 140 to 60 mg./cu. cm. Losses occurred through the evaporation of the more volatile compounds, and there was a downwards displacement resulting in a concentration of creosote in the outer ⅛ in. of wood near the ground line. The chemical changes varied with the composition of the original preservative.

2457. LUMSDEN, G. Q. **Fortified wood preservative for Southern Pine poles.** *For. Prod. J.* 10 (9), 1960 (456–62). 19 refs.

Laboratory bio-assay and sapwood stake tests showed that the addition of 2% commercial PCP to coal-tar creosote increased toxic efficiency by ca. 40%, with the possibility of reducing failures due to bleeding. [Cf. *F.A.* 15 No. 4221.]

2458. **New preservatives.** *Extr.* from *Rep. For. Prod. Aust. 1959/60*, 1960 (18–9).

Investigation of distillate oils from brown-coal tar produced by the Lurgi gasification process showed that the 200–300° C. fraction, used as a "wash oil", has satisfactory toxicity but lacks the permanence of Australian standard creosote. A higher-temperature fraction gave promising results, but there are practical handling difficulties. Distillation of wood tar from a charcoal-iron plant in W. Australia yielded up to 50% heavy oil of high phenolic content which gave good results in laboratory tests.

2459. Belford, D. S. **The impregnation of timber by water borne preservatives. II. X-ray contact micro-radiography.** *J. appl. Chem.* 10 (8), 1960 (345–7). 6 refs. O.R.S.

The application of X-ray contact micro-radiography to the study of wood preservatives is discussed. This technique allows the study of preservative distribution without staining, and the present study (on *Pseudotsuga taxifolia* wood treated with Tanalith C) has confirmed earlier observations that the preservative is situated within the cell wall rather than merely lining the cell cavity. [Cf. *F.A.* 21 Nos. 2440–1.]

2460. Kovačević, S. Natrijev silikofluorid kao zaštitno sredstvo za drvo. **[Na_2SiF_6 as a wood preservative.]** *Drvna Ind.* 10 (9/10), 1960 (134–6). 4 refs. [Croat.g.] P.R.

A short general account of Jugoslavian work with Na_2SiF_6 and methods of using this salt.

2461. Cockcroft, R. **A new method for detecting the presence and depth of penetration of boron in treated timber.** *Holzforschung, Berlin* 14 (4), 1960 (117–9). 7 refs. [E.e.g.] P.R.

Describes the new polyvinyl-alcohol/iodine test. It is simple and rapid, has a useful sensitivity range, and, without having to dry the wood, gives positive results with timber containing an equivalent of ≮0·15 lb./cu. ft. of borate, expressed as H_3BO_3. A dark-blue or blue-green coloration is obtained where the B compound has penetrated. The test has advantages over the turmeric spot test currently in use. *From author's summary.*

2462. Wilson, W. J. **The determination of boron in treated wood.** *Analytica Chimica Acta, Amsterdam* 19 (6), 1958 (516–9). 5 refs. [E.e.] O.R.S.

Describes: (1) the detection of B in treated wood by turmeric; and (2) the determination of B in treated wood by ashing in the presence of $Ba(OH)_2$ followed by titration with NaOH in the presence of mannitol.

2463. Becker, G. Beitrag zur Kenntnis der Wirksamkeit von Borverbindungen als Holzschutzmittel gegen Insekten und Pilze. **[The efficacy of boron compounds as preservatives against insects and fungi.]** *Holz Roh- u. Werkstoff* 17 (12), 1959 (484–9). 50 refs. [G.g.e.] P.R.

Reviews the literature, and reports investigations that showed the following results: lethal concentrations of H_3BO_3 for first-instar larvae of *Hylotrupes bajulus* are 0·4 kg./cu. m. wood within 12 weeks, 0·3 kg. within 6 months; for $Na_2B_4O_7$ 0·5–0·6 and 0·3–0·4 respectively. The efficacy of B compounds against first-instar larvae of *Anobium punctatum*, *H. bajulus*, *Ambeodontus tristis*, and *Lyctus brunneus* is compared with that of other preservative salts. B compounds are effective only as stomach poisons, and are suitable only for protection of timbers not exposed to the weather. Using the Kolle flask method, the following inhibition ranges, in kg./cu. m. wood, of H_3BO_3 against fungi were determined: *Merulius lacrymans* 0·36–0·54; *Coniophora cerebella* 0·53–0·73; *Lenzites trabea* 0·52–0·72; and *Lentinus lepideus* 0·54–1·4. Mould growth on Pine sapwood blocks was prevented by impregnation with 2·5% but not with 1% solutions of H_3BO_3 and $Na_2B_4O_7$.

2464. Spiller, D. **Toxicity of pentachlorophenol to the common house borer *Anobium punctatum* de Geer. II. A trial of effectiveness, 1951–1960.** *N.Z. J. Sci.* 3 (3), 1960 (534–8). 3 refs.

Six concentrations in power kerosene were used for dip treatment of *Podocarpus dacryoides* sapwood blocks. The 4 lower concentrations failed completely in the first year and the highest (5·0%) gave some protection for 8 years. It is concluded that PCP is relatively ineffective against *A. punctatum* and that its use should be discontinued.

2465. Davenport, J. C., and Mirams, R. V. **The preservative treatment of *Pinus radiata* timber by pressure impregnation.** *N.Z. J. Sci.* 3 (3), 1960 (453–67). 4 refs.

Measurements were made of the quantity of preservative (Celcure) in timber treated at two plants, both using a full-cell vacuum/pressure/vacuum cycle. Results are tabulated. The general standard of treatment at the plants was very similar in spite of fairly wide differences in operating conditions and schedules. Significant correlations were found between absorption and wood moisture content, both in respect of the whole charge and in individual sticks, and also between absorption and basic density of the sticks within a charge. Complete penetration and a very uniform distribution of preservative was, however, always achieved.

2466. Willeitner, H. Beiträge zur Holzschutztechnik—achte Mitteilung: Praxisnahe Untersuchungen über den Einfluss einer Hitzebehandlung auf die Tränkfähigkeit von Bauholz. **[Wood protection techniques—Report 8. Investigations, in conditions similar to practice, on the effect of heat treatment on the preservative uptake of building timber.]** *Holz Roh- u. Werkstoff* 18 (7), 1960 (250–60). 25 refs. [G.g.e.] P.R.

[Cf. *F.A.* 21 No. 1094.] Examines the effect of heating the wood to various temperatures (60, 80, 100 and 150° C.) followed by various waiting periods (none, 1 day, 4 weeks, and 1 day followed by a 5-sec. water dip plus 1 more day's storage) on the amount absorbed and depth of penetration of 3 water-soluble and 2 oily preservatives by pieces of Pine and Spruce (40 × 60 mm. cross-section) from (1) a 5-sec. dip and (2) a 24-hr. soak. Absorption and penetration depth depended on the moisture content of the wood; with (1), the uptake of aqueous preservatives at wood m.c. 4–12% was less, but of oily ones greater, than at higher wood m.c.'s. If the hot specimens were dipped without a waiting period, less preservative was absorbed with increasing heating temperature, especially with the aqueous preservatives. With (2), the wood m.c. had no influence on uptake, but, in hot specimens soaked without a waiting period, the preservative uptake increased sharply the hotter they were. Conclusions for practical application of these findings are drawn.

2467. BAVENDAMM, W., and SEEHANN, G. Beiträge zur Holzschutztechnik.—Neunte Mitteilung: Praxisnahe Untersuchungen über die Imprägnierung von Buchenholz durch Streichen und Trogtränkung. **[Wood protection techniques—Report 9. Investigations, in conditions similar to practice, on the preservation of Beech timber by brushing-on and by soaking].** *Holzforsch. u. Holzverwert.* 12 (3), 1960 (50–4). 10 refs. [G.g.e.] P.R.

In parallel trials on Beech [cf. *F.A.* 21 No. 1094] green and air-dry sapwood and heartwood samples were treated by (*a*) brushing-on twice, and (*b*) trough soaking for 8 and 24 hours, with two oil preservatives, and a silicofluoride or a bifluoride (both at 5, 10, 15 and 20%), and compared with wood similarly treated with NaF. Generally, the volumes absorbed were greater for oil preservatives than for the salts, but the difference decreased with the more intensive treatments. Salt absorption increased with increasing concentration of the solution, and was greater in sapwood than in heartwood. In general, the salts penetrated 1–10 mm. deep, and the oils only 0·1–1 mm. Particularly deep penetration was obtained with the bifluoride salt in 20% solution. Penetration depth increased with concentration of the solution, with wood moisture content, and with intensity of treatment.

2468. GRAHAM, R. D., and MILLER, D. J. **Marine exposure tests of pressure-treated Douglas Fir and Southern Pine.** *ASTM Special Technical Publication, American Society for Testing Materials, Philadelphia* No. 275, 1959 (58–69). 9 refs.

Tabulates results of the first biennial inspection of dried ¾ × 3 × 18-in. specimens of Douglas Fir heartwood and sapwood and Southern Pine sapwood immersed in late summer and autumn 1957 at 3 exposure sites on each of the U.S. Pacific and Atlantic coasts, after full-cell treatment with (*a*) creosote (at a mean retention (m.r.) of 35·7 lb./cu. ft.), (*b*) a 70/30 creosote/coal-tar solution (at m.r. 33·7 lb./cu. ft.), (*c*) ammoniacal Cu arsenite (Chemonite), on some Douglas sapwood pieces only (at m.r. 0·38 lb./cu. ft.), and (*d*) Cu formate (at m.r. 0·28 lb./cu. ft.). Data on general deterioration and fouling of the test panels are summarized, and fouling, wood-boring and other organisms are listed. Preliminary results indicate that best protection is given by (*c*), followed by (*a*) and (*b*). It is intended to inspect the panels annually to determine the extent and cause of deterioration, rated on a scale from 0 (no attack or no fouling) to 6 (destroyed or heavy fouling). [Cf. *F.A.* 19 No. 4939.]

2469. SWEENEY, T. R., and PRICE, T. R. **Coal-tar creosote studies. III. Distillation residue studies.** *Corrosion, Houston* 16, 1960 (339*t*–342*t*). From *abstr.* in *Chem. Abstr.* 54 (17), 1960 (17773). P.R.

[Cf. *F.A.* 20 No. 2455.] To determine the required % of residue for maximum protection of wood by coal-tar creosote, tests were made in which [Pine?] panels (both pre-leached and unleached) were impregnated with creosotes containing varying %'s of residue, and exposed to marine-borer attack. Leaching rates were determined for the various compound creosotes. All distillation fractions studied gave the panels a good resistance, generally much greater to attack by Teredinidae than by *Limnoria*. Creosote fractions boiling below 160° C. at 15 mm. were relatively ineffective against Teredinidae. Creosotes having residue contents between 15 and 50% appeared to be equally effective. The rate of loss of creosote from impregnated panels leached with flowing water at 80° was roughly inversely proportional to the residue content of the creosote.

2470. SELBO, M. L. **Successful [preservative] treatment of glued laminated wood.** *Wood Pres. News* 38 (8), 1960 (10 . . . 14). P.R.

Outlines the merits of (1) treating the already glued and machined laminate, vs. (2) treating the timber before gluing members of the required size or shape, in the manufacture of pressure-impregnated laminated wood members, and gives details of the application of various preservatives in relation to the timbers and glues used.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

See No. 2474.

843. Fireproofing and Fire Resistance

See also Nos. 2430, 2548.

2471. COLLISTER, L. C. **Fire retardant treatments on the Santa Fé.** *Iowa St. Coll. J. Sci.* 34 (4), 1960 (685–92). 7 refs. O.R.E.

Discusses protection of timber trestle bridges: (*a*) those already in track, and (*b*) new constructions. Tests are described. For (*a*) the most promising method is a surface treatment with a grease-like material that has P present in the form of triaryl phosphate. For (*b*) it is thought that triaryl phosphate in a 50/50 creosote/petroleum solution at a retention of 0·1 lb. active P per cu. ft. will give adequate protection.

844. Attack by Plant Organisms

See also No. 2519.

844.1. Sap-staining and Mould Fungi

See Nos. 1383, 2079, 2463, 2522.

844.2. Wood-destroying Fungi

See also Nos. 1546, 2018–33, 2402–4, 2409–10, 2443, 2522.

2472. PURI, Y. N. **A note on the decay resistance test of Ghana timbers.** *Indian For.* 86 (10), 1960 (621–2). 2 refs.

Results of laboratory tests (using *Polystictus versicolor*) on *Guarea cedrata*, *Entandrophragma cylindricum*, *E. utile*, *E. angolense*, *Terminalia superba*, *Khaya ivorensis*, *Turraeanthus vignei*, *Nesogordonia* [*Cistanthera*] *papaverifera*, *Cylicodiscus gabunensis*, *Mitragyna stipulosa*, *Mansonia altissima*, *Lovoa klaineana*, *Piptadenia africana*, *Nauclea* [*Sarcocephalus*] *diderrichii*, *Afrormosia elata*, *Lophira alata*, *Tarrietia utilis*, *Triplochiton scleroxylon* and *Terminalia ivorensis*.

2473. ARZUMANIAN [ARZUMANJAN], G. A. **Comparative resistance of wood of certain Armenian trees to wood decaying fungi (*Coniophora cerebella*).** *Izvestija, Akademija Nauk Armjanskoj SSR, Erevan* (*Serija Tehničeskih Nauk*) 10 (5), 1957 (83–8). [Russ.] From *abstr.* in *Prev. Deterior. Abstr.* 18 (1), 1960 (Wood 2). P.R

Small blocks of Juniper, Basswood [*Tilia* sp.], Aspen, Elm, Oak, Beech, Poplar, and Hackberry [*Celtis caucasica*?] from Armenian trees, and of Pine (heartwood [h.w.] and sapwood [s.w.]), Spruce and Fir [unspecified] from trees growing outside Armenia, were placed in flasks containing *C. cerebella* cultures, the weight losses, expressed as % of dry matter, being determined after 30 days. Juniper and Oak showed the greatest resistance, their wt. losses being 1·9 and 2·3% respectively. Pine s.w., Aspen and Spruce were most susceptible, with respective wt. losses of 44·5, 49·7 and 50·2%. Pine h.w. showed a loss of 38·8%, the other species ranging from 32·4 to 37·3%.

2474. ARSUMANJAN [ARZUMANJAN], G. A. **[Effect of compressing wood on its resistance to wood-destroying fungi.]** *Doklady Akademii Nauk Armjanskoj SSR, Erevan* 28, 1959 (183–6). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 14 (4), 1960 (128). [G.] P.R.

Scots Pine sapwood samples compressed from 20 × 30 × 6 mm. to 20 × 20 × 6, and from 20 × 40 × 6 to 20 × 20 × 6, were subjected to attack by *Coniophora cerebella*. After 1 month at 20–22° C., unpressed samples had lost 39·1% of their initial weight (dry basis), vs. only 26 and 10·6% respectively for the compressed samples.

2475. GOLD, H. S. **Distribution of some lignicolous Ascomycetes and Fungi Imperfecti in an estuary.** *J. Elisha Mitchell Sci. Soc.* 75 (1), 1959 (25–8). 8 refs. L.S.

Observations were made at 6 collecting stations in the Newport river, N. Carolina. Five species of lignicolous Fungi Imperfecti and 18 ascomycetous species were collected, and their patterns of distribution, as affected by temperature and salinity were studied. Some fungi showed a distinct distribution pattern, while others did not. Both temperature and salinity apparently control the distribution of *Ceriosporopsis halima*, *C. cambrensis*, *Lulworthia floridana*, *L. submersa* and *Trichocladium.* At high temperatures these species occurred in waters of high salinity only; with declining temperature of the water, they occur in less saline waters. *Lulworthia salina* was found in waters of salinity as low as 3·3%. *Leptosphaeria discors* and *Lignicola laevis* developed on wood submerged at stations throughout the entire estuarine salinity range, i.e. 0–36%. *Torpedospora radiata* was found in both the fresh- and sea-water sectors. All these fungi have previously been reported as marine fungi.

2476. OLIVER, A. C. **Soft rot: a summary of existing knowledge.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. *B/IB/*2, 1959. pp. 13. 21 refs.

Briefly reviews existing knowledge on microfungal decay in timber, describing its characteristics, occurrence, the fungi responsible (Ascomycetes and Fungi Imperfecti) and the environmental conditions that suit them. The results of laboratory tests on soft rot, the toxicity of preservatives and the chemical nature of the decay are dealt with, and the associations of soft rot with beetle, marine-borer and bacterial attack described. A note on microscopic techniques of examination is included, and the importance of soft-rot attack on timber in water-cooling towers is indicated. *From author's summary.*

2477. LIESE, W. Die Moderfäule, eine neue Krankheit des Holzes. **[Soft rot, a new disease of wood.]** *Repr.* from *Naturwissenschaftliche Rundschau, Stuttgart* 1959 (11), (419–25). 28 refs. [G.] P.R.

A review discussing symptoms, causative organisms, conditions for their development, effect on strength and durability of wood and bamboo, practical importance, etc.

2478. DUNCAN, C. G. **Microscopical studies of wood deteriorated by the lower fungi.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (99). O.B.D.

Pure cultures of the lower fungi, representing more than 20 genera of Fungi Imperfecti and 4 of Ascomycetes, isolated from timber showing the soft-rot type of deterioration, produced decay in test blocks of both hardwoods and softwoods. Microscopical observations of sections from wood with different degrees of attack are described and illustrated by photomicrographs. These show the changes that occur in the fungus and the wood as the hyphae pass through pit orifices and bore holes, and as they produce the unique cavities parallel to the fibrillar orientation within the secondary wall.

2479. **Rot in water cooling towers. *Gloeocystidium lactescens.*** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1959*, 1960 (30).

G. lactescens, originally isolated from waterlogged, decayed Scots Pine in cooling-tower mist eliminators, caused only slow decay of Beech and even less decay of Scots Pine sapwood exposed to attack by normal methods of malt-agar culture. However, when the moisture content of thin Beech test blocks was controlled in soil bottles, active decay took place.

Maximum decay was obtained in test blocks conditioned to an initial m.c. of 60%. The characteristics permitting *G. lactescens* attack of waterlogged wood are not yet known.

2480. MILAZZO, F. H. **Polysaccharides produced by some wood rotting fungi.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (2), 1960 (287). O.R.S.

Nine polysaccharides produced by several rot fungi in a chemically defined medium were isolated and found to be qualitatively identical, all being 1-4-linked unbranched (linear) glucans.

2481. GROHN, H., and DETERS, W. Über den Abbau von Fichtenholz durch *Lenzites saepiaria.* **[The breakdown of Spruce wood by *L. saepiaria.*]** *Holzforschung, Berlin* 13 (1), 1959 (8–12). 26 refs. [G.g.e.] P.R.

Determinations of OCH_3 in Klason lignins and in alcohol-extracted lignins showed that its content decreases practically linearly with the degree of wood breakdown, this being defined by the actual content of Klason lignin in the infected wood. It is concluded that lignin changes expressed by the decrease in the OCH_3 content are mainly the result of enzyme action, and it is shown that ether-soluble lignin fragments occur in infected wood.

2482. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species. (XV) Effect of light upon the mycelial growth of sporophore formation of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr. and *L. saepiaria* (Wulf.) Fr.]** *J. Jap. For. Soc.* 40 (5), 1958 (198–201). 8 refs. [Jap.jap.e.*e.*]

Studies of (*a*) sporophore formation and (*b*) mycelial growth, under the different colours of the spectrum (including darkness), indicated that (*a*) was most effectively initiated under violet light and (*b*) equally retarded under any band of the spectrum.

2483. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species. (XVI) Some experiments on the germination of basidiospores of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saepiaria* (Wulf.) Fr.]** *J. Jap. For. Soc.* 40 (7), 1958 (293–8). 11 refs. [Jap.jap.e.*e.*]

Studies using various germinating media and temperatures showed that spores of these species falling on wood surfaces may remain alive for long periods under a considerable range of natural conditions.

2484. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species. (XVII) Some experiments on the germination of basidiospores of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saepiaria* (Wulf.) Fr. (2).]** *J. Jap. For. Soc.* 40 (11), 1958 (476–80). 6 refs. [Jap.jap.e.*e.*]

[See preceding abstr.] Tabulates the results of experiments to determine the influence of environmental factors on basidiospore germination. Exposure to direct sunlight inhibited, and to diffuse light greatly reduced, germination. Germination was good at 95% r.h., but failed at 77% (*L. abietina*) and 68% (the other 3 species). The effects of temperature, r.h., and duration of storage on spore viability are discussed.

2485. DILLER, J. D., and KOCH, E. J. **The effect of environmental conditions on the growth of *Merulius lacrymans*.** *Abstr.* in *Phytopathology* 50 (9), 1960 (633–34).

In this study, in which wood blocks of 13 species were put with infected wood chips in containers holding different soils, with or without fertilizers at the bottom, and then kept in 4 different environments, the major weight-loss differences were due to the environments [reported in *F.A.* 20 No. 2496]. The pH of the substrates and the addition of fertilizers showed little correlation with weight losses, but these were greater on soil than on sand. Average losses ranged from 1·9% for *Maelura pomifera* to 16·7% for *Quercus rubra.*

2486. GOKSØYR, J. **Studies on the metabolism of *Merulius lacrymans* (Jacq.) Fr. II. The respiration of washed mycelium from shake-cultures.** *Physiol. Plant., Copenhagen* 13 (3), 1960 (559–70). 15 refs. [E.e.]

The respiration of washed water-culture mycelium of *M. lacrymans* in a medium of glucose, peptone, KH_2PO_4, $MgSO_4$, and thiamine was studied. It was found that fresh mycelium had a respiratory intensity of ca. 10–17 µl. O_2/mg. mycelium dry weight/hour at 22·5° C. The addition of glucose increased this intensity only slightly, but caused larger increases in mycelium starved for 24 or 48 hours. The respiratory pH optimum was ca. 3·5–4·0. Under almost anaerobic conditions the respiratory quotient increased somewhat, but values >2 were not found. Endogenous respiration was largely of amino acids, coming partly from the amino-acid pool and partly from a proteolytic process in progress while the mycelium was starved. After addition of glucose, endogenous respiration was kept at the same level, but without it, slowly decreased. [Cf. *F.A.* 20 No. 3849.]

2487. WAŻNY, J. Wpływ działania grzybów *Merulius lacrymans* (Wulf). Fr. i *Coniophora cerebella* Pers. na fizyczne i mechaniczne własności niektórych gatunkow drewna. **[The effect of *M. lacrymans* and *C. cerebella* on the physical and mechanical properties of certain timber species.]** *Folia for. polon.* (*Drewn.*) No. 1, 1959 (9–81). 23 refs. [Pol.pol.russ.e.]

Presents substantially the same conclusions as those previously reached by the author for the physical [see *F.A.* 21 No. 3790] and mechanical [see *F.A.* 20 No. 2498] properties of Pine (heartwood and sapwood), Spruce, Beech and Oak.

2488. ROYES, J., and LOVELESS, A. R. ***Poria carbonacea* (Berk. & Curt.) Cooke as a cause of timber rot in Jamaica.** *Trans. Brit. Mycol. Soc.* 43 (3), 1960 (571–7). 6 refs. O.B.D.

Poria carbonacea was found to be the cause of decay of structural timber (*Brosimum alicastrum*) in newly built houses in Jamaica. Data are presented on its occurrence, its characteristics and rate of decay. It has several features in common with

Merulius lacrymans, but the mycelial sheets on the surface of the infected timber were not seen to form mycelial strands. Optimum temperature for growth is ca. 31·5° C., and the minimum relative humidity for development of mycelium on agar is ca. 90% at 30° C. *From authors' summary.*

2489. WEAVER, J. W., JEROSKI, E. B., and GOLDSTEIN, I. S. **Toxicity of dyes and related compounds to wood-destroying fungi.** *Applied Microbiology, Baltimore* 7 (3), 1959 (145–9). 18 refs. O.R.S.

Presents tables showing the degree of toxicity of 89 dyes and related compounds to *Lentinus lepideus*, *Poria incrassata*, *P. monticola*, *Lenzites trabea*, *Polystictus versicolor* and *Coniophora puteana* when tested on nutrient agar plates. The arylmethane basic dyes, particularly those containing 3 phenyl groups with 2 *p*-dialkylamino substituents, proved notably effective fungicides. Brilliant green and malachite green were the most toxic of the group. Reactions to the compounds were sometimes highly specific.

845. Attack by Animals

See also No. 2519.

845.1. Marine Borers

See also Nos. 2468–9.

2490. BRAMHALL, G. **Protection of wooden structures in British Columbia waters.** *Bull. For. Br. Can.* No. 126, 1960. pp. 73. 100 refs.

In three parts, covering: (1) protection of marine installations, principally against marine borers; (2) service records of B.C. marine installations; (3) discussion of service life of untreated and creosoted marine piling; also an appendix on the biology of *Limnoria lignorum* and *Bankia setacea*, and an annotated bibliography.

2491. GANAPATI, P. N., and RAO, M. V. L. **On some Crustacean woodborers from Andamans.** *Curr. Sci.* 29 (7), 1960 (275–6). 7 refs. A.P.B.

Presents a preliminary report on Limnoriids collected from submerged wooden planking in an Andamans timber yard. Five species were identified, 3 of which, *Limnoria insulae*, *L. unicornis* and *L. platycauda*, have not previously been recorded from Indian waters.

845. 2. Terrestrial Borers

See also Nos. 1383, 2079, 2409–10, 2463–4.

2492. LYNGNES, R. Studier over *Hylecoetus dermestoides* L. (Col., Lymexylidae) under et angrep på bjørkestokker på Sunnmøre 1954–1955. **[Studies on *H. dermestoides* during an attack on Birch logs at Sunnmøre 1954–55.]** *Norsk Entomologisk Tidsskrift, Bergen* 10 (4/5), 1958 (221–35). 9 refs. [Nor.e.] I.I.E.

Describes detailed laboratory studies of the biology of the insect at various stages of its development. At temperatures below 8° C., egg-laying ceased, beginning again at those over 10°. Wood 1¼ years old was preferred to newly cut material.

2493. KELSEY, J. M. **Symbiosis and *Anobium punctatum* de Geer.** *Proceedings of the Royal Entomological Society of London, London* 33*A* (1/3), 1958 (21–4). 2 refs. From *abstr.* in *Rev. appl. Ent.* 47*A* (10), 1959 (364).

Experiments are described indicating a close relationship between the presence of yeast cells on the eggs, and optimum development of the larvae of *A. punctatum*, though the larvae were able to survive on a low nutritional plane for 17 months in the absence of yeast cells.

2494. BECKER, G. **Predators and parasites of wood-destroying insects in buildings.** Forest Products Research Laboratory, Princes Risborough. 1960. pp. 15 + 4 photos, 1 drawing, 1 gph. 26 refs. Limited distribution. Transl. from *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (76–86). [See *F.A.* 18 No. 3453.]

2495. LYNGNES, R. Iakttakelser over *Tillus elongatus* L. (Coleoptera, Cleridae). **[Observations on *T. elongatus*.]** *Norsk Entomologisk Tidsskrift, Bergen* 11 (1/2), 1959 (1–6). 4 refs. [Nor.e.] I.I.E.

Describes the various stages of the insect, the larva of which is a predator on larvae of *Anobium punctatum* and other insects present in the tunnels.

2496. SPILLER, D. **A study on control of infestations of the common house borer *Anobium punctatum* de Geer. Part 2. A test of diesel oil and fractions 1953–60.** *N.Z. J. Sci.* 3 (3), 1960 (539–42). 1 ref.

The light fraction applied as a single brush coat to infested boards gave good initial control, but the boards soon became reinfested; the heavy fraction was ineffective initially but gave complete protection thereafter. The unfractionated oil gave effective control. [Cf. *F.A.* 14 No. 2828.]

2497. FRANZ, E. Der Bambusbohrer, *Chlorophorus annularis*, in Frankfurt a.M. **[The bamboo borer, *C. annularis*, in Frankfurt.]** *Natur und Volk, Frankfurt a.M.* 89 (4), 1959 (133–5). 5 refs. [G.] L.S.

An adult beetle emerged from bamboo furniture in a Frankfurt office in October. Five larvae and a pupa were found in a stick 40 cm. long [no data on species or origin]. [Cf. Fisher, *F.A.* 4 p. 194.]

2498. SCHMIDT, H. Der Scheinbock oder Werftbohrkäfer. [***Nacerdes melanura*.**] *Holz-Zbl.* 86 (95), 1960 (1331). [G.]

Briefly describes the insect, with notes on taxonomy, injuries etc.

2499. KINGHORN, J. M. **Chemicals for preventing ambrosia beetle attacks.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (5), 1960 (3).

[Cf. *F.A.* 21 No. 768.] Experiments in treating Douglas Fir logs with lindane (generally used to protect logs from ambrosia beetle) and Thiodan, showed that the latter was much the more effective, reducing damage by 88% vs. 63% for lindane. It is, however, rather more toxic to both mammals and fish, and before it is used to treat water-stored logs, its effect on fish and other aquatic life should be studied.

845.3. Termites

See also No. 2557.

2500. IONESCU, M. A. La répartition géographique et l'écologie des termites dans le sud-est de l'Europe. **[The distribution and ecology of termites in S.E. Europe.]** *Rev. Biol., Bucarest* 4 (1), 1959 (107–16). 25 refs. [F.] O.R.S.

2501. HICKIN, N. **Termites in France. Collecting species found in Europe.** *Timb. Technol.* 68 (2258), 1960 (459–61). 3 refs.

Account of a tour for collecting *Reticulitermes lucifugus*, *R. l.* var. *santonensis*, and *Kalotermes flavicollis* in France for research in England, with some discussion of factors favouring attack.

2502. SCHULTZE-DEWITZ, G. Form und Intensität des Termitenangriffes an Hölzern verschiedener Struktur und Rohdichte. Erste Mitteilung: Prüfungen an getrenntem Früh- und Spätholz. **[The manner and severity of termite attack on wood of different structure and density. I. Tests with separated early and late wood.]** *Holz Roh- u. Werkstoff* 18 (10), 1960 (365–7). 11 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 1178; 21 No. 2489; 22 No. 1140.] Separated samples of early and late wood of Scots Pine, Spruce, and Pedunculate Oak were exposed to *Reticulitermes lucifugus*. The termites preferred to attack radial surfaces, eating into the wood in a tangential direction. The amount of wood destroyed (both early and late) decreased with increasing density. *From author's summary.*

2503. BESS, H. A., and OTA, A. K. **Fumigation of buildings to control the dry-wood termite, *Cryptotermes brevis*.** *J. econ. Ent.* 53 (4), 1960 (503–10). 6 refs.

Fumigation with MeBr at 2 lb./1000 cu. ft. for 15–19 hr. apparently eliminated all natural infestations of *C. brevis* in 23 out of 24 houses fumigated, but mortality of termites in wooden block cages exposed in these houses varied from 100% to nil. SO_2F_2 at 2 lb./1000 cu. ft. for as little as 1·5 hr., killed all termites in similar blocks. $C_2H_4Br_2$ was as inferior to MeBr as SO_2F_2 was superior.

846. Steaming

2504. PERKITNY, T., ŁAWNICZAK, M., and MARCINIAK, H. **The influence of steaming on the swelling pressures of wood.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4804, 1960. pp. 16 + 1 dgm., 8 sets of gphs., 5 tbls. 12 refs. Transl. by J. Hardy from *Holz Roh- u. Werkstoff* 17 (2), 1959 (54–61). [See *F.A.* 20 No. 5288.] Limited distribution.

847. Drying (Seasoning)

See also Nos. 2307, 2359.

2505. SALAMON, M. **Kiln drying of unbundled shingles at high temperatures.** *Timber of Canada* 21 (9), 1960 (35–7).

Perfection No. 1 grade Western Red Cedar shingles can be dried from green to shipping weight with a 10-minute preheating at 250° F. dry-bulb followed by a rise over 15 min. to 290°, which is held for 40–50 min. followed by a 10-min. fall to 250°. Humidity is uncontrolled. Effect on durability is not yet known.

2506. GORJAČEV, F. I. Iz opyta suški lesomaterialov peregretym parom vlagi, isparjaemoj iz vysušivaemoj drevesiny. **[Experiments in drying sawn timber with superheated steam derived from the moisture in the wood being dried.]** *Trud. Inst Lesohoz. Probl., Riga* No. 15, 1958 (21–4). 6 refs. [Russ.] N.L.L.

Describes briefly the adaptation of a conventional compartment kiln for superheated steam drying, involving hermetic sealing, increased heating, and faster circulation (by internal fan) of the drying agent. A series of tests was held, in which Scots Pine and Birch boards (mainly 40 mm. thick) were dried from 60–70 to 7–10% m.c. Results showed that increased output and financial savings were possible by this new method. [Drying quality is not discussed.]

2507. TYLTIN'Š, K. K. Vlijanie suški drevesiny sosny na ee fiziko-mehaničeskie svojstva. **[Drying Scots Pine wood and its effect on physical and mechanical properties.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (39–52). 12 refs. [Russ.] N.L.L.

Samples of Scots Pine were kiln-dried with superheated steam (110 and 115° C.) and their physical and mechanical properties then determined and compared with those of samples either air-seasoned or kiln-dried at 50 and 80°. Results are tabulated in detail. Since the most important strength characteristics (viz. compression ∥, tension ∥, static bending, modulus of elasticity, specific work in impact bending) were reduced by only 6% on average, this method of drying is considered perfectly acceptable in preparing wood for the furniture industry.

2508. TYLTIN'Š, K. K. Vlijanie suški drevesiny sosny na istiraemost′ ee i soprotivlenie vydergivaniju šurupov i gvozdej. **[The effect of drying Scots Pine wood on its resistance to abrasion and to screw and nail withdrawal.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (53–66). 8 refs. [Russ.russ.] N.L.L.

Scots Pine samples were (*a*) air-seasoned, (*b*) kiln-dried at 80° C., (*c*) dried with superheated steam at 110 and 115° C. Wear and screw- and nail-withdrawal tests were made and the results tabulated. Wear increased, in all three planes, with increasing drying temperature, and was greatest at all temperatures in the tangential plane and least in the transverse plane. Screw-withdrawal resistance decreased in the radial and tangential planes with increasing drying temperature, but hardly at all in the transverse plane. At all drying temperatures, screw- and nail-withdrawal resistance were greatest in the radial and least in the transverse plane, and increased with increasing wood density. The practical importance of these findings for the wood-using industries is pointed out.

2509. Mikit, Ė. A., and Upmanis, K. K. Novye principial'nye shemy kamer dlja suški pilomaterialov v bol'ših ob''emah peregretym parom. **[New, basic kiln designs for drying sawn timber in large quantities by superheated steam.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (13–8 + 1 set of dgms.). 10 refs. [Russ.] N.L.L.

Presents, with drawings, a design for a compartment and a progressive kiln, the former having an annual output of 9000 cu. m. and the latter of 27,000 cu. m. of timber.

2510. Mikit, Ė. A., and Upmanis, K. K. Cel'nometalličeskaja kamera dlja suški pilomaterialov peregretym parom. **[All-metal chamber for drying sawn timber with superheated steam.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (19–20 + 1 set of dgms.). [Russ.] N.L.L.

A brief description of a Latvian compartment kiln, which has internal fan circulation, with engineering drawings. Annual output is 2000 cu. m. of sawn timber.

2511. Prasad, V. N. **Universal wood-seasoning kiln.** *Research & Industry, New Delhi* 5 (5), 1960 (125–6). From *abstr.* in *Chem. Abstr.* 54 (16), 1960 (16826). P.R.

Unlike conventional steam-type driers, the new Indian-designed "Universal" kiln has no boiler, its circulating air (c.a.) being heated by metal pipes through which hot flue gases are passed from a furnace. At no stage do the flue gases enter the seasoning chamber or come in direct contact with the c.a., for they enter at one end of the pipes laid across the passage of the c.a. and escape through a chimney at the other end. Uniform heating is obtained with the aid of special devices for ensuring the maximum and continuous utilization of heat from the burning fuel. Increased c.a. humidity is obtainable by spraying hot water over the hot pipes. A 30–40% over-all saving in fuel consumption (vs. steam-type kilns) is claimed.

2512. Malmquist, L., and Meichsner, H. **Investigations on cross circulation drying tunnels.** *Transl. For. Prod. Lab. Can.* No. 135, 1960. pp. 19. 3 refs. *Transl.* from *Holz Roh- u. Werkstoff* 17 (10), 1959 (384–96). [See *F.A.* 21 No. 2495.] Limited distribution.

2513. Abolin'š, Ja. T. Pnevmatičeskaja sušilka sistemy "ILP" dlja skorostnoj suški nekotoryh drevesnyh i rastitel'nyh produktov. **[Pneumatic drier (ILP model) for rapid drying of wood and plant products.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (7–11). 2 refs. [Russ.russ.] N.L.L.

Describes the design and performance of the drier, which is intended for drying greenstuffs (e.g. conifer needles), comminuted wood, sawdust, etc.

2514. Kauman, W. G. **Collapse in some *Eucalyptus* after treatment in inorganic salt solutions.** *For. Prod. J.* 10 (9), 1960 (963–7). 17 refs.

Contrary to the findings of Chudnoff [cf. *F.A.* 16 No. 4727] no reduction of collapse and final shrinkage compared with water-treated controls was found when heart- and sapwood of *Eucalyptus rostrata* of Australian and Israeli origin was immersed for a total of 38 days in various concentrations of HCl, NaCl, and $ZnCl_2$, and heartwood of Australian *E. regnans* in HCl, NaCl, $CuCl_2$ or combinations, or $NaHCO_3$ for 67 days. In treatments that affected the wood chemically, including $ZnCl_2$, both collapse and final shrinkage were actually increased, suggesting a connexion of collapse with loss of hemicelluloses, and of recovery with loss of lignin.

2515. Muller, R. Z. Proizvodstvennyj opyt suški drevesiny v petrolatume. **[A production-scale trial in drying wood in petrolatum.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (25–37). 1 ref. [Russ.russ.] N.L.L.

[Cf. *F.A.* 19 No. 3585; 21 No. 2499.] A trial at Riga in 1956 showed that, as compared with kiln drying, the quality of drying in petrolatum was not as high, annual output of dried sawn timber per sq. m. of productive area was less, costs were higher, and supervision of the drying process was simpler. It is considered that reports on the cheapness and quality of petrolatum-drying are incorrect, and that it is undesirable to adopt it in place of kiln drying.

848. Timberyard Practice. Handling and Storage of Timber

2516. Rüb, F. Moderne Födereinrichtungen rationalisieren die Holzbearbeitung. **[Modern conveying equipment rationalizes the woodworking industry.]** *Holztechnik* 40 (10), 1960 (432–44). [G.] P.R.

A general survey of all German types of conveying equipment.

2517. Soiné, H. Das Förderwesen in der Holzindustrie—Sechste Mitteilung: Stetigfördermittel. **[Transport systems in the woodworking industry. VI. Conveyors.]** *Holz Roh- u. Werkstoff* 18 (9), 1960 (346–54). [G.g.e.] P.R.

[Cf. *F.A.* 21 No. 5092.] Describes roller-, chain-, and belt-conveyors, etc., and how the various conveyors are combined in production lines.

2518. Müller, H. R. Fördermittel und Förderhilfsmittel für die Holztechnik. **[Conveyors in the timber industry.]** *Holztechnik* 40 (10), 1960 (445–8). [G.] P.R.

A general account, dealing mainly with cranes.

2519. Edwards, D. W. **Mill and timberyard hygiene.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 12 (1), 1960 (9–11).

Recommends, and briefly outlines the practical value of, certain hygienic procedures based on the reduction of insect and fungus hazards by the removal of breeding grounds, and on the greater ease of handling timbers in a clean yard, stressing the good effects of such practices on customer confidence and staff morale.

2520. Marshall, P. **The on site protection of seasoned building timbers.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 12 (1), 1960 (13–5).

Briefly describes the protection afforded by the following: (1) block stacking, in which the close contact between the stacked timbers prevents the circulation of air, and moisture can increase only in the outer boards of the stack; (2) protective coverings; (3) storage under cover, and (4) painting.

2521. KARHÁNEK, M., and FELLEGI, J. **Trials with storing free piled wood chips.** *Papír a Celulosa* 15, 1960 (112–4). [Cz.?] From *abstr.* in *Chem. Abstr.* 54 (17), 1960 (17879). P.R.

Trials on the storage of freely poured piles of Beech and Poplar chips indicated that their drying rate was very slow and particularly affected by climatic conditions, mainly in the 50- to 80-cm.-deep surface layer. Increases of up to 55% in the m.c. of a 25- to 30-cm.-deep surface layer penetrated by rainfall, may occur. The maximum depth for contamination by mechanical impurities from the atmosphere is ca. 30 cm.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See Nos. 1686, 2411, 2531.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 1581, 1891, 1958, 2423, 2442, 2444, 2447, 2514.

2522. **Examination of defective Sitka Spruce.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1959*, 1960 (30).

Laboratory examinations of a variety of discolorations in U.K.-grown Sitka logs indicated that the light-brown discolorations in the immediate vicinity of drought checks were not associated with fungal attack, but where the checks extended through the bark, discoloration was more extensive and varied, a number of non-wood-destroying fungi (moulds) being present. Most of the other discolorations examined were irregularly distributed across the log and could be related to the presence of bark injuries or pruning wounds. No marked discoloration of the wood accompanied the advanced decay by *Armillaria mellea* present in the extreme butt ends of a few logs; in contrast, extensive and marked pinkish-brown discoloration was associated with the early stages of *Fomes annosus* attack; these, it was concluded, cannot be determined by examination of cross-sections but are best sought after conversion of defective material into boards. The majority of the discolorations observed were ascribable to abnormal heartwood formations after injuries to the tree.

2523. MCNABB, H. S., JR., and EDGREN, J. W. **Pathological and normal heartwood in hardwoods.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (244–5). [E.] O.B.D.

Observations on the formation of pathological (traumatic) heartwood (p.h.w.) and normal heartwood (n.h.w.) in *Acer saccharinum*, *A. saccharum*, *Quercus alba*, *Q. velutina*, *Prunus serotina*, *Tilia americana* and *Ulmus americana* show similarities. Increment borings made in *A. saccharinum* resulted in streaks of p.h.w. both above and below the boreholes. The same phenomenon was observed in other species. Other wounding agents caused the same reaction. Amount of p.h.w. produced varied with the species. Gross observations on the development processes of p.h.w. and n.h.w. appeared similar. Field observations on decay-zone lines and sap-stain fungi indicated that wood-inhabiting organisms reacted similarly to p.h.w. and n.h.w. Decay resistance of p.h.w. of *A. saccharinum* to two Maple heart-rot fungi indicated an intermediate status between normal sapwood and h.w. Possible seasonable relationships in the amount of p.h.w. formed were indicated for *A. saccharum*. Wound treatments had little influence on p.h.w. development. Wood-moisture relationships of p.h.w. in terms of relative turgidity paralleled those in n.h.w. formation. Upon ageing, p.h.w. appears to become identical with n.h.w. This suggests possible means of studying the basic phenomenon of h.w. formation and obtaining h.w. in young trees.

2524. PANKEVICIUS, E. R. **Project S.5. Collapse in timber. Progress Report No. 24. Experiment S.5/23. Influence of position in tree on collapse intensity (first report).** Division of Forest Products, C.S.I.R.O., South Melbourne. 1960. pp. 10 + 9 gphs. 6 refs.

For the present study, material from 2 *Eucalyptus gigantea* and 6 *E. regnans* trees was used, test specimens of both sapwood and heartwood being taken from 3 levels in each tree, and dried under various conditions. Results for both species showed that both gross shrinkage and recoverable collapse varied with height in the tree, are greatest in butt material, and decrease with increase in height. *From author's summary.*

853. Grading of Wood in the Rough

2525. ERTELD, W. Sortierung und Standardisierung von Rohholz. **[Grading and standardization of rough timber.]** *Arch. Forstw.* 9 (6), 1960 (561–8). 2 refs. [G.russ.e.]

Discusses the East German instruction of 1955 revising the HOMA (*Holzmessanweisung*) of 1936. To the use-classes of the latter (sleepers, mining timber, pulpwood) have been added veneer logs, piling, masts etc. Quality- and use-classes, forms of timber, properties and defects, have been further defined. Measurements of logs by the Krippel (1937) method and of cordwood by stacked cu. m. is prescribed.

2526. SIIMES, F. E. Tutkimus kuusisahatukkien ominaisuuksista ja tukkilaadun vaikutuksesta sahatavarain laatuun sekä alustava ehdotus kuusisahatukkien laatuluokitusta varten. **[The properties of Spruce logs, the effect of log quality on that of sawtimber, and a proposal for grading rules.]** *Pap. ja Puu* 42 (3), 1960 (79–98). [Fi.fi.e.] P.R.

Test sawings of over 4200 logs were made at 8 sawmills. The grading rules used in sorting the logs, like those for Pine [cf. *F.A.* 21 No. 1159] divide the logs into 3 classes; there are also requirements relating to the size of individual knots and to general knottiness (assessed by eye). The correlation between general knottiness and the sum of knots [in inches of diameter] in a 5-ft. length of log is shown in a table and graph. Other data given in tables [Finnish legends] and graphs [legends in Finnish and English] include: [%] frequency distribution of log lengths, size of the biggest knot, and frequency [%] of the sum of knots for different log grades and diameters; the distribution of sawn timber into export grades for different log grades; the lengths of sawn timber obtained and the relative consumption of sawn timber [from different top diameters and log grades]. A correlation was found between annual ring width and the sum of knots, for logs from S. and N. Finland separately. *From author's summary.*

854. Grading of Converted Timber

2527. Crow, G. B. **Grading European softwoods [in the U.K.]. Alternative system proposed by Mr. G. B. Crow.** *Timb. Tr. J.* 235 (4391), 1960 (69–70).

The present system, which abandoned one distinguishing 6 qualities and grouped the top 3 or 4 as "unsorted", is based on the piece and is criticized for allowing "unsorted joinery" to include too many thirds and fourths, for disregarding the effect of further conversion with some consequent unwarranted relegation and promotion, for ignoring texture and suitability for further manufacture, and for allowing some down-grading of suitable carcassing to sixths. The system proposed differs in using the system of cuttings, instead of the piece, for grading deals and battens, and introducing prime and manufacturing grades in the higher qualities plus a new structural grade. Below this would be the present "Utskott" grade.

2528. Andrews, G. W. **Suggested manufacturing tolerances in producing [E. Canadian softwood] lumber**. *Timber of Canada* 21 (9), 1960 (43–5). 2 refs.

Tabulates tolerance limits showing nominal thickness (1–5 in.) or widths (2–12 in.), the Canadian lumber standard minimum dressed size and allowances for dressing, sawing (gang, band, or circular) and shrinkage, and the tolerance limits of rough green lumber to give the C.L.S. dressed sizes (dry).

2529. Jenkins, J. H. **Grade marking [in Canada] for export to U.S.A.** *Mimeo. For. Prod. Lab. Can.* No. O–182, 1960. pp. 7.

Describes the changes in organization and adaptation of grading rules completed or under discussion, which became necessary when the U.S. Federal Housing Administration made grade-marking compulsory for houses built under their inspection.

2530. Burgess, H. J. **The development of stress grading rules for Malayan timbers (Part 1)**. *Malay. Forester* 23 (3), 1960 (175–90). 18 refs.

In a consideration of knot limitations, graphs are plotted for strength ratios of 80, 75, 63, 60 and 50%, showing the knot sizes permitted by recent U.S. rules for all-purpose grading. Canadian and Australian recommendations, shown on the graphs for the 75 and 60% grades, are less stringent in certain respects than U.S. practice for these grades, and this relaxation is adopted as a precedent for the Malayan rules, which follow a similar relaxation in the 80, 63 and 50% grades which have been chosen from a series of "preferred numbers" for local use. Discussion of the 50% grade includes comments on certain British publications, including the British Standard Code of Practice CP112. The Malayan rules allow knots that are ⅛, ¼, and ⅓ the face dimension respectively for the 80, 63 and 50% grades, with a maximum diameter of 1½, 3 and 4 in. respectively; the same limitations are applied at all points on the piece being graded. *From author's summary.*

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and other Cellulose Derivatives

See also Nos. 1896, 2297, 2332, 2401, 2407, 2521.

2531. **Pulpwood properties: response of processing and of paper quality to their variation.** *Tappi* 43 (11), 1960 (40*A* . . . 64*A*). P.R.

A digest of information based mainly on results of genetic and silvicultural research, and dealing with 13 significant pulpwood properties (density, growth rate, chemical composition, fibre length and diameter, % early and late wood, etc.) viewed as variables whose effects are registered in terms of (1) the facility and economy of the industry's processing, and (2) properties of the resulting pulp and paper product. Emphasis is laid mainly on Southern Pines as being the chief U.S. pulpwood source, but other conifer and broadleaved pulpwoods are dealt with.

2532. Guha, S. R. D., and Singh, M. M. **Chemical pulps for kraft papers from a mixture of conifers**. *Indian For.* 86 (9), 1960 (563–5).

It is concluded, from preliminary tests, that unbleached sulphate pulps in yields of 45–64%, with satisfactory strength properties for the production of unbleached kraft papers, can be prepared for a mixture of *Cedrus deodara*, *Pinus excelsa*, *Abies pindrow* and *Picea morinda*. Bleached sulphate in yields of 43–52% can also be obtained from such a mixture.

2533. **[Pulping experiments with exotic conifers and with Norwegian Birch.]** *Extr.* from *Beretn. Papirind. ForsknInst., Oslo 1959*, 1960 (19–21). [Nor.]

Yields of chemical pulp from Norwegian-grown Western Hemlock, Silver Fir and Siberian Fir were respectively 195, 154 and 185 kg./cu. m. solid measure. Strength of the unbleached pulp was roughly the same for all three, and all could be bleached to a high degree of whiteness. Factors (e.g. temperature, moisture content of the chips, chip size) affecting alkali consumption in pulping Birch by the cold soda process were studied.

2534. Saint-Germain, J. L'avenir des pâtes de feuillus vu par la papeterie française. **[The future of hardwood pulps as seen by the French paper-making industry.]** Imprimerie J. G. Malochet, Paris. 1959. pp. 139. [F.]

Outlines the development of the pulp and paper-making industry in France, and reviews the particular problems of using hardwoods, giving details of state and state-aided private research. The great changes in the structure of the industry since 1945 are reviewed.

2535. Venet, J. À propos de l'utilisation des feuillus en papeterie. **[The use of hardwoods in paper making.]** *Rev. for. franç.* 12 (11), 1960 (688–99). 10 refs. [F.]

Reviews results to date of research in progress in France.

2536. Chiaverina, J., and Choulet, B. Étude de l'aptitude papetière du bois de '*Pterocarya caucasica*' et '*Pterocarya stenoptera*'. **[The suitability for paper-making of the wood of *P. caucasica* and *P. stenoptera*.]** *Rev. for. franç.* 12 (11), 1960 (700–9 + 2 photos). 2 refs. [F.]

Results of a study made at the École de Papeterie at Grenoble, show the wood of both species to be very short-fibred, and not suitable for pulping.

2537. **Pulp and paper making: British Honduras timbers.** *Extr.* from *Rep. Trop. Prod. Inst., Lond. 1959*, 1960 (13–4).

An examination has been made separately and together of the pulping qualities of *Ochroma lagopus*, *Schizolobium parahyba*, *Heliocarpus donell-smithii*, *Cecropia peltata* and *Spondias mombin*. It is concluded that a mixture of these can produce high-yield semi-chemical pulps, light in colour, under comparatively mild pulping conditions.

2538. Peel, J. D. **Pulp and paper manufacture in Malaya. Part IV. Pulpwood from broad-leaved woods of Malayan forests; an assessment of its suitability as the basic raw material of a paper pulp industry.** *Malay. Forester* 23 (3), 1960 (147–74). 22 refs.

[Cf. *F.A.* 21 No. 5130.] A general discussion of available supplies, costs, pulping qualities of the woods, the type of mill to suit local conditions etc. The author concludes that the mill must plan for an eventual production of 100 tons a day, which would entail the annual cutting of 4000 acres of primary forest. Rubberwood, straw, and Bamboo have many advantages over forest woods.

2539. Seelkopf, C., Rodríguez Sánchez, J., and Corothie, H. Investigación de plantas herbáceas como materia prima para pulpa y papel. **[Investigation of herbaceous [and woody] plants as raw material for pulping.]** *Rev. for. venez.* 2 (2), 1959 (63–106). 65 refs. [Span.span.]

With the object of finding a material suitable for pulping in mixture with bagasse, investigations were made on *Euphorbia tirucalli*, *Agave sisalana* and *Bambusa vulgaris*. Descriptions are presented of wood of *E. tirucalli*, and the properties of the fibres of *A. sisalana* and *B. vulgaris*. A mixture of 50% bagasse, 40% *E. tirucalli* and 10% *A. sisalana* gave a paper with superior properties to that from Canadian Pines.

2540. Lamb, G. E. R. **The efficiency of mechanical pulping processes.** *Tappi* 43 (11), 1960 (939–44). 14 refs. P.R.

Describes pulping experiments made on 120 μ-thick tangentially cut *Picea abies* wafers in order to measure the mechanical energy required per unit surface area. The results obtained are of the order of 10^5 ergs/sq. cm., indicating that the efficiency of mechanical pulping processes may be ca. 20%.

2541. Brecht, W., and Berberat, R. **Effects of the width of annual rings in Sprucewood on the results of mechanical pulping.** *Wochenblatt für Papierfabrikation, Biberach* 88, 1960 (247–9). [G.] From *abstr.* in *Chem. Abstr.* 54 (19), 1960 (20195). P.R.

For strong, long-fibred mechanical pulp, the optimum width of Spruce annual rings was shown to be ca. 3 mm., rather higher than generally assumed hitherto. But for finely ground, slow pulps, wood with very narrow growth rings proved the best. Power consumption was relatively low.

2542. Chidester, G. H., Laundrie, J. F., and Keller, E. L. **Chemimechanical pulps from various softwoods and hardwoods.** *Tappi* 43 (10), 1960 (876–80). P.R.

Discusses the results of experiments on the making of high-yield chemi-mechanical pulps [defined] from Aspen, Western Red Cedar, Balsam Fir, Western Hemlock, and a mixture of hardwoods, extensive tabulated data being presented, comparing the properties and energy consumptions of the various types of pulp obtained.

2543. Crosby, H. L., and Coe, N. N. **HiFibre process of hardwood pulping.** *Paper Tr. J.* 144 (13), 1960 (33–5). P.O.

Briefly describes a chemi-mechanical method of pulping hardwoods involving the use of lime instead of the more expensive NaOH. The work of a continuous rollermill (the Haug Koller mill) is discussed; this mill is said to achieve nearly ideal conditions for mechanical impregnation in that centrifugal action arranges the chips flat to the cylinder wall.

2544. Tiščenko, D. Kislotnaja kondensacija lignina. **[Acid condensation of lignin.]** *Ž. prikl. Him.* 32 (1), 1959 (157–65). 33 refs. [Russ.] P.O.

Describes the process of lignin condensation or "inactivation" and outlines its theoretical and practical importance in the production of cellulose from wood that cannot be cooked by the sulphite process at the normal rate if it has been pretreated with hot water, or solutions of acids or alkalis, or if phenols, especially polyhydric, enter the cooking liquor from the bark, i.e. particularly in the case of unbarked floated Spruce and Douglas Fir.

2545. Greiner, W. J. **Hardwood sawdust for cold caustic pulp appears feasible.** *Paper Tr. J.* 144 (5), 1960 (27). P.O.

Summarizes very briefly pulping conditions, yield, chemical characteristics of sawdust pulp, and physical characteristics of hand sheets made from it and treated with 10–20% NaOH (based on moisture-free wood), with penetration times varying from 20 to 60 min. Data obtained indicate that the sawdust pulp is as usable as cold-soda pulp from chips, especially for furnishes and corrugated board.

2546. Baklien, A. **The effects of extraction on black liquor from Eucalypt pulping. [With discussion.]** *APPITA, Melbourne* 14 (1), 1960 (5–17). 15 refs.

Some factors affecting the behaviour of black liquor obtained from *Eucalyptus gigantea* by the caustic-soda pulping process have been investigated. The evaporation and burning characteristics of black liquor are adversely affected by ellagic acid as its Na salt and Mg complex, by large quantities of wood tannins, and by excess inorganic salts. Ellagic acid has been estimated in several species of *Eucalyptus* and in *Nothofagus cunninghamii*, and its stability in alkaline solutions (pH 7 to 14) at temperatures from 110 to 170° C. has been investigated. The presence of Mg exerts a considerable stabilizing effect on ellagic acid due to complex formation. Part of the Mg originates from the white liquor but there is sufficient in the wood to account for the Mg-ellagic-acid complex found in various pipe deposits. *From author's summary.*

2547. Marton, R. **Brightness of high yield pulps. I. Morphology and nature of coloring materials in wood.** *Tappi* 43 (10), 1960 (826–31). 15 refs. P.R.

In microscopic studies on unstained sections of various [mainly hardwood] species, with emphasis on *Betula papyrifera*, microspectrophotometric techniques were used to examine the coloured components of the wood and also of the pulp fibres *in situ*. The bleach-resistant brown discoloration found in the cold-soda pulps obtained was due to certain substances, darker and more abundant in heartwood (h.w.) than in sapwood (s.w.), that occur in the cells of the wood. The results suggest that the colour of the cold-soda pulps from hardwoods is due mainly to the brown incrustations in the morphological structure of wood which, though not chemically identical with the lignin, probably develop from the same precursors [cf. *F.A.* 21 No. 979]. Their behaviour in bleaching is different from the response of lignin towards conventional bleaching agents.

2548. Miłkowski, W., Olpiński, W., and Zyska, B. **Tests on fire-resistant preservation of timber support.** *Prace Głownego Instytuta Górnictwa Komun., Katowice* No. 223, 1958. pp. 30. [Pol.] From *abstr.* in *Chem. Abstr.* 54 (20), 1960 (21589). P.R.

Describes the use of chlorinated lignin-sulphonic acid as a fire-retardant and fungicidal agent for timber, similar results being obtained to those for $(NH_4)_2HPO_4$ treatment but at 25% of the cost. Even under exceptionally humid conditions, leaching out was very slow, and even at relatively high temperatures no ignition occurred from open fire [flame?]. Methods of reducing its corrosive effects on metals are discussed, and quantitative data and results of fungicidal tests included.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 2434, 2444.

2549. Plath, E. **Development of the European standards and test methods for particle boards.** *For. Prod. J.* 10 (10), 1960 (556–60).

The quality requirements and test methods laid down in B.S. 2604–1955 and in the German, French and Dutch draft standards are described. Though no standard methods for testing such properties as machinability, stability of dimension or shape, or surface smoothness, have yet been developed, it is thought that most of these could be correlated with one or more properties susceptible to standard testing.

2550. Kollmann, F. **Variation of properties in hardboards.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4845, 1960. pp. 5 + 10 dgms., 8 gphs., 1 tbl. Transl. by M. Harkins from *Holz Roh- u. Werkstoff* 15 (6), 1957 (247–52). [See *F.A.* 20 No. 1226.] Limited distribution.

2551. Die Hauptherstellungsverfahren für Spanplatten. **[The main methods of manufacturing particle boards.]** *Holz* 15 (9), 1960 (290–4). [G.] P.R.

A short description of particle-board manufacture by extrusion (as in the OKAL method) and by flat-pressing (as in the Behr, Fahrni, Bähre-Bison, Bartrev and Miller-Hofft methods).

2552. Liiri, O. Tutkimuksia lastulevyteollisuuden puuraaka-aineista I. Suomalaiset puulajit lastulevyn raaka-aineina. **[Investigations on the wood used as raw material in the particle-board industry. I. Finnish tree species as a raw material for particle board.]** *Pap. ją Puu* 42 (9), 1960 (467–84). 3 refs. [Fi.*e.*] P.R.

Three-layer particle boards, prepared from Pine, Spruce, Birch, Aspen and Alder, were tested for their strength properties and also their water absorption and dimensional stability during soaking or during variations in relative humidity. Results are given in graphs and tables. Wood density proved to be the main factor in determining the suitability of the raw material, affecting both strength and dimensional stability. Bark in the particles used for the middle layer did not adversely affect board properties. All the tree species appeared to be suitable for particle board. Birch gave boards with a density >800 kg./cu. m. but it could be satisfactorily mixed with lighter species. Alder and Aspen gave the best surface smoothness. *From author's summary.*

2553. Nysenko, N. T., and Nysenko, L. A. Drevesno-stružečnye plity iz obessmolennoj ščepy. **[Chipboards from resin-extracted chips.]** *Gidrol. lesohim. Prom.* 13 (5), 1960 (17). 1 ref. [Russ.] P.R.

The extracted chips should be sorted into three fractions: (*a*) big (8 mm. mesh), (*b*) medium (3 mm.), (*c*) small (dust). The best-looking and strongest boards were made from fractions (*b*) and (*c*); (*a*) should be further comminuted in a hammer-mill, but it is preferable to produce the fresh chips more carefully before extraction, and so avoid having such big chips. Boards from extracted chips were as strong as, and more water-resistant than, boards made from ordinary chips. [Cf. *F.A.* 21 No. 5129.]

2554. KUMAR, V. B. Die statistische Qualitätskontrolle in der Spanplattenindustrie—Zweite Mitteilung: Spänetrocknung. [**Statistical quality control in the particle board industry. II. Chip drying.**] *Holz Roh- u. Werkstoff* 18 (9), 1960 (341–3). 3 refs. [G.g.e.] P.R.

[Cf. *F.A.* 21 No. 3846.] Discusses quality control of moisture content of wet and dried middle- and top-layer chips.

2555. OZOLIN'Š, A. P. Tehničeskie svojstva stružečnyh plit, izgotovlennyh po metodu Instituta lesohozjajstvennyh problem. [**Technical properties of chipboards made by the method of the Institute of Forestry Problems, Riga.**] *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (183–94). 8 refs. [Russ. russ.] N.L.L.

The method involves the use of castor-oil cake as a binder. Boards were made from several types of particle (chips, shavings, etc.) and from sawdust. The results of strength tests on the boards are given in tables and graphs. Static bending, tensile, and compression strengths of the boards were roughly equal to those of boards made with a urea-formaldehyde resin; but their density was 25% greater than that of urea-formaldehyde boards produced with the same pressure. The boards could be worked and veneered in the ordinary way, and are considered suitable for large-scale use.

2556. ZIEDIN'Š, I. O., and JUKNA, A. D. Mnogoslojnye drevesnostružečnye plity. [**Multilayer particle boards.**] *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (201–12). 4 refs. [Russ.russ.] N.L.L.

An account of laboratory production trials of semi-hardboards (0·4–0·8 g./c.c.) using castor-oil cake and sapropel as binders, with a discussion of costs. The method appears attractive.

2557. BROWN, G. E., and ALDEN, H. M. **Protection from termites: Penta for particle board.** *For. Prod. J.* 10 (9), 1960 (434–8).

PCP-Na added to the resin before it was sprayed on the chips showed promise. The addition of 1·25% of dry-chip weight to boards made with phenolic resin and exposed in the open in contact with the ground, protected them almost completely for 12 months. Boards made with urea resin were attacked by termites and deteriorated generally under test conditions.

2558. KEYLWERTH, R. Über das Verfahren "mit feuchteren Aussenschichten" zur Herstellung dreischichtiger Holzspanplatten. [**On manufacturing three-layer particle boards by the method of "moister outer layers".**] *Holzforsch. u. Holzverwert.* 11 (3), 1959 (51–7). 20 refs. [G.g.e.] P.R.

[Cf. *F.A.* 18 No. 3498.] Attempts a physical explanation of the complicated processes taking place during hot pressing, and describes the functional connexion between temperature and wood moisture content and their influence on the plastic deformation, surface smoothing, and compression of the glued chips. The method cited, involving surface spraying with water, increases surface smoothness, improves the elastic-mechanical properties, and reduces press time. In agreement with the literature, it was found that an effective increase in the m.c. of the surface layers can be achieved with very small amounts of water (including resin water). There is general agreement that the time taken to heat up the chip mat is reduced by 2–3 min., as a result of water movement and improved contact at the smoothed surfaces of the chip mat.

2559. KLAUDITZ, W. *et al.* Herstellung und Eigenschaften von Holzspanwerkstoffen mit gerichteter Festigkeit. [**Manufacture and properties of particle boards with directional strength.**] *Holz Roh- u. Werkstoff* 18 (10), 1960 (377–85). 14 refs. [G.g.e.] P.R.

[Cf. *F.A.* 22 No. 1186.] Discusses the possibilities inherent in the orientation of chips, and describes experiments on the problem, including a method and mechanical apparatus for making chip mats with oriented chips. Experimental boards with oriented chips of *Aucoumea klaineana*, *Terminalia superba*, and *Fagus sylvatica* were made and tested, and the results (tabulated) were very promising. The possibility of electrostatic orientation of the chips is also discussed, on the basis of earlier experiments.

2560. MÖRATH, E. Fachgerechte Anwendung von Spanplatten im Bauwesen. [**The proper use of particle boards in building.**] *Holzforsch. u. Holzverwert.* 11 (6), 1959 (129–36). [G.g.e.] P.R.

A general account, including details for their use in partitions, outer walls, wall panelling, flooring, and ceilings.

2561. LUNDGREN, S. Å. Fiberskivor, spånskivor och plywood—några jämförelser. [**Fibreboards, particle boards and plywood—some comparisons.**] *Svensk PappTidn.* 63 (16), 1960 (510–6). [Sw.sw.e.g.] P.R.

Gives some comparative data on mechanical and hygroscopic properties, workability, and painting properties.

2562. LUNDGREN, S. Å. Fachgerechte Anwendung von Faserplatten im Bauwesen. [**Correct use of fibreboards in building.**] *Holzforsch. u. Holzverwert.* 11 (4), 1959 (81–6). 2 refs. [G.g.e.] P.R.

An account of Swedish research, emphasizing the importance of correct measurement of the hygroscopic properties, especially the irreversible dimensional changes, and the advisability of tensile, rather than bending tests. Water absorption should be measured separately on the smooth side and on the screen side.

2563. Lundgren, S. Å. Ergibt die Biegeprüfung der Holzfaserplatten richtige Werte? **[Do bending tests on fibreboards give the correct values?]** *Holzforsch. u. Holzverwert.* 11 (4), 1959 (86–8). [G.g.e.] P.R.

[Cf. *F.A.* 19 No. 4993.] Results of bending tests are affected by several sources of error, connected with the fact that the material is not elastic but visco-elastic; i.e. stretching and strength depend on loading time. Therefore in bending tests very tough fibreboards possess an apparently lower strength. The current bending tests should be replaced as soon as possible by tensile testing and stretch measurements at low stresses and long loadings.

2564. Helge, K. Undersøkelser over utbytte og platekvalitet ved fremstilling av porøs wallboard av forskjellige virkeskvaliteter. **[Pulp yields and quality of porous fibreboard obtained from different woods.]** *Norsk Skogind.* 14 (9), 1960 (330–8). 2 refs. [Nor.e.*e*.] P.R.

Factory tests confirmed that stored slabs of Spruce were inferior in pulp yield and board quality to green slabs [cf. *F.A.* 20 No. 2585]. Further laboratory tests indicated that increasing the preheating time only increased the differences. Tests with Birch showed that this species was unsuitable. Even small admixtures greatly reduced the strength of boards, possibly because of high extractive content. It was possible to make boards of Pine as strong as those from Spruce, but for this the pulp had to be refined to a very high degree of freeness, resulting in excessively long drainage times. *From author's summary.*

2565. Packman, D. F. **The production of hardboard from tropical timbers. VI. Kapur (*Dryobalanops* spp.), Keruing (*Dipterocarpus* spp.), Red Seraya (*Shorea* spp.), and White Seraya (*Parashorea plicata*).** *Trop. Sci.* 2 (3), 1960 (140–53). 5 refs.

Satisfactory hardboard was made on an experimental scale from each of these 4 species grown in North Borneo, and from a mixture of Red and White Seraya. After treatment of the wood chips in a laboratory Asplund defibrator, no further refining of the fibre or additions of waterproofing or bonding agents were found to be necessary. Desirable qualities of strength and water resistance were obtained by a suitable choice of conditions in the press, followed by hot-air treatment of the boards. [Cf. *F.A.* 22 No. 1194.] *From author's summary.*

2566. Kumar, V. B. **Studies on thickness variations in semihardboard.** *Svensk PappTidn.* 63 (17), 1960 (565–9). 9 refs. [E.e.sw.g.] P.R.

In continuation of earlier work [cf. *F.A.* 20 No. 3926], reports on semihardboard. The variations in the board from the uppermost daylight are fundamentally different from those in the lower sections of the press. The frequency picture of the uppermost board gives evidence of the presence of two populations, one corresponding to the ends and the other to the middle of the board. Boards from the other daylights show a Gaussian distribution. The variability within a board was found to be a direct function of its thickness. The problem of sampling for production control is discussed. *From author's summary.*

2567. Gružan, A. Ja. Opiločnyj beton i ego primenenie v stroitel′stve. **[Sawdust/cement mixtures and their use in building.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 15, 1958 (213–21). 2 refs. [Russ.] N.L.L.

Tabulates and graphs the results of laboratory tests on the strength and durability of sawdust/cement mixtures.

2568. Sandermann, W., Preusser, H. J., and Schweers, W. Studien über mineralgebundene Holzwerkstoffe. Dritte Mitteilung: Über die Wirkung von Holzinhaltstoffen auf den Abbindevorgang bei zementgebundenen Holzwerkstoffen. **[Studies on mineral-bonded wood materials. 3. The effect of wood extractives on the setting of cement-bonded wood materials.]** *Holzforschung, Berlin* 14 (3), 1960 (70–7). 30 refs. [G.g.e.] P.R.

[Cf. *F.A.* 19 No. 3449.] It is thought that wood extractives impair the setting of cement by forming a skin round the cement particles. Normal cement had a hydration temperature >80° C., but after being impaired by the addition of glucose, it was only 28°. In tests on cement/wood-flour mixtures, the hydration temperature was >60° with Spruce, but ≯27° with Beech. Tests with a radioactive glucose (as a setting inhibitor) showed that insoluble Ca compounds were formed with glucose. Electron-microscope observations showed that, in the normal setting of cement, very quickly crystallized hydration products arise, which turn into a micro-crystalline gell-like mass after a time. With impaired cement, fewer such crystals were formed. Determination of the hydration temperature of wood-flour/cement mixtures is thought to be a rapid method of testing the suitability of wood species for use in the manufacture of cement-bonded articles.

863. Wood Hydrolysis. Saccharification

2569. Schoeneman, K. La mise au point de l'hydrolyse du bois d'après le procédé Rheinau. **[Wood hydrolysis by the Rheinau process.]** *Chim. et Industr.* 80 (2), 1958 (140–50). [F.f.e.span.g.] L.S.

Reviews briefly German, Russian, and U.S. processes, notably the Madison process [see *F.A.* 16 No. 4777], and describes in detail the process of selective hydrolysis developed at Rheinau, using medium-strength (38·5%) HCl and giving a total yield of sugars of 63% (calculated on dry wood). Data on production capacity, investment and profitability are included.

2570. Gorohov, G. I., and Korsakov, I. V. Osvoenie proizvodstva piščevoj gljukozy iz drevesiny. **[The production of edible glucose from wood.]** *Gidrol. lesohim. Prom.* 13 (5), 1960 (26–30). 1 ref. [Russ.] P.R.

Describes the plant at the Kansk Hydrolysis Factory, which produces glucose from wood by hydrolysis with concentrated HCl.

2571. Sharkov [Šarkov], V. I., Korol′kov, I. I., and Garmanova, E. N. **Hydrolysis of wood at**

high temperature. *Sbornik Trudov Vsesojuznogo Naučno-Issledovatel'skogo Instituta Gidroliznoj i Sulfitno-Spirtovoj Promyšlennosti* No. 6, 1958 (5–9). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (16), 1960 (16825). P.R.

The results of experiments on Spruce shavings indicated that, with the temperature of the hydrolysis >200° C., the yield of sugars increased from 29·0–32·8% to 36–43%. The yield of total reducing substances at 240° was 52%.

2572. Mudretsov [Mudrecov], A. I., and Kozlov, V. N. **Dependence of the relative distribution coefficient of sugars on wood hydrolysis conditions.** *Trudy Uralskogo Lesotehničeskogo Instituta* No. 12, 1958 (79–92). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (17), 1960 (17879). P.R.

The relative distribution coefficient (K) of sugars during wood hydrolysis depends, in 170–200° C. range, on the H_2SO_4 catalyst concentration, time, solids/liquid ratio, and the degree of comminution and anatomical structure of the wood. Physical structure does not significantly affect K or the yield of reducing substances. The hydrolysis rate of cellulose in sapwood, heartwood, and branches is almost the same.

866. Utilization of Wood Extractives

See also Nos. 1507, 2553, 2597.

2573. Barbot, S. I. Izvlečenie smolistyh veščestv iz osmola metodom orositel'noj ėkstrakcii. **[Extraction of resinous substances from stumpwood by the sprinkler method.]** *Gidrol. lesohim. Prom.* 13 (3), 1960 (9–11). [Russ.russ.] P.R.

In the Barboter sprinkler (in contrast to the conventional battery) method developed by the author, continuous extraction occurs while the chips are travelling on a conveyor below six of the sprinklers. Details of the plant and process are described (with illustration), together with graphs showing extraction at various temperatures, sprinkler zones, chip moisture contents, etc. The spent chips were found suitable for making particle boards.

2574. Gurič, N. A. Ob izmel'čenii osmola dlja kanifol'no-ėkstrakcionnogo proizvodstva. **[Comminution of resinous Pine stumpwood for rosin extraction.]** *Gidrol. lesohim. Prom.* 13 (2), 1960 (10–1). [Russ.russ.] P.R.

Recommends the use of a machine designed by S. I. Barbot, in which the wood is fed to the knives and the cut is made tangentially, as in defibrating machines. Two knives on the drum cut into the surface of the piece of wood, and another knife chops off a uniformly thin sheet along the grain; in this process the thin sheet is broken into individual small chips of uniform length and thickness (20 × 1·5 × 2 mm.). Pilot-production trials gave promising results.

2575. Kolenko, I. P., and Koslow, W. N. [Kozlov, V. N.]. **[Extraction of resinous substances from fresh stumpwood resin by organic solvents.]** *Izvestija Sibirskogo Otdelenija Akademii Nauk SSSR* 1958 (8), (103–13). [Russ.] From *abstr.* in *Holzforschung, Berlin* 14 (4), 1960 (125). [G.] P.R. [Cf. *F.A.* 21 No. 1191.]

2576. Gerasimov, M., and Vytov, V. Novaja tehnologičeskaja shema izvlečenija kanifoli iz othodov ėkstrakcionnogo proizvodstva. **[A new technique for recovering rosin from waste in the extraction industry.]** *Gidrol. lesohim. Prom.* 13 (1), 1960 (15–6). 1 ref. [Russ.russ.] P.R.

Describes and illustrates a new Bulgarian extractor for recovering rosin from the formerly wasted sawdust etc. formed in the milling of resinous Pine stumpwood.

2577. Sadgopal. **Essential oils and their components in aromatic plants. The essential oil of Eaglewood**. *France et ses Parfums* 3 (16), 1960 (62–71). [F.?] From *abstr.* in *Chem. Abstr.* 54 (20), 1960 (21659). P.R.

A survey of the growth and physical and chemical changes occurring during the maturity of the essential oils of *Aquilaria agallocha*.

2578. Csordás, M. Termeljünk cserzöanyagot a gesztenyefából. **[Production of tannin from Chestnut wood.]** *Erdö* 7 (5), 1958 (180–2). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (4), 1958 (9). [E.] C.G.B.

To increase tannin supplies, a matter of national importance, it is suggested that all *Castanea sativa* wood except valuable sawlogs and veneer logs should be ground or chipped and extracted before incorporation in particle board at the factory at Szombathely. The wood contains 5–10% tannin vs. 5·6 for Oak bark.

2579. Mihai, P. **Extraction of tannin from wood of Common Oak by sodium sulphite**. *Revista de Chimie, Bucureşti* 9, 1958 (255–9). 14 refs. [Rum.e.] From *abstr.* in *J. appl. Chem.* 9 (4), 1959 (i–401). O.R.S.

Na_2SO_3 (1·75%) was added to air-dried, unbarked wood which was subsequently treated with an aqueous solution of $Na_2S_2O_5$ (2%); a 10–12% increase in tannin yield was thus obtained.

867. Destructive Distillation

2580. Nordström, O. Holz als Motortreibstoff immer noch aktuell. **[Wood still of interest as a motor fuel.]** *Wald u. Holz* 42 (1), 1960 (13–5). [G.]

Describes Swedish trials with a system in which producer gas is used in diesel engines in addition to diesel oil, reducing the consumption of liquid fuel by 75–80%. Medium 35- to 40-h.p. tractors ran for 1 hour on 1 litre plus 12–15 kg. wood, and a 10 ton, 100-h.p. lorry used 3·7 litres and 63 kg. wood/100 km. The gas is introduced with the air stream. The generators have been improved, particularly as regards filtering the gas to minimize cylinder wear.

2581. Korjakin, V. I., and Sokolova, A. I. Suhaja peregonka dereva—potencial'nyj istočnik polučenija furfurola. **[Dry distillation of wood—a potential source of furfurol.]** *Gidrol. lesohim. Prom.* 13 (5), 1960 (3–6). 1 ref. [Russ.russ.] P.R.

An account of the method, semi-production trials, and yields at the CNILHI.

89. Other ('Minor') Forest Products

892. Vegetable Products

892.4. Bark Products. Tanstuffs. Cork

2582. HATHWAY, D. E. **Researches on the tannin content of the stembark of Sitka Spruce and Douglas Fir.** *Extr.* from *Rep. For. Res. For. Comm., Lond. 1958/59*, 1960 (115–6).

It has been shown, from 27-year-old trees, that there is no appreciable variation in the tannin content of Sitka Spruce stembark harvested at different seasons of the year, but that the red colour is more pronounced in winter-harvested bark than in that peeled during active growth periods. It was found that available tannin diminished on standing, which suggested that bark should be peeled and dried within a month of felling. In Douglas Fir, higher values for tannin, benzene-soluble wax and dihydroquercetin were obtained from dominant than from suppressed trees.

2583. **Tanning materials.** *Extr.* from *Rep. Trop. Prod. Inst., Lond. 1959*, 1960 (12).

Examination of *Anogeissus schimperi* bark from W. Nigeria confirmed previous findings that, in spite of much variability, the general level of tannin contents was very low, and that the bark would be of value only for local tanning where more suitable materials were not available.

2584. JAMES, N. D. G. **The harvesting of bark for tanning.** *Quart. J. For.* 54 (4), 1960 (345–50). 6 refs.

The harvesting and preparation of (chiefly Oak) bark is described and illustrated, and yields and returns briefly discussed.

2585. ALEXA, G., and CHIRIŢĂ, A. **Roumanian Willow bark as a source of tanning material.** *Buletinul Institutului Politehnic din Iaşi* 3 (3/4), 1957 (109–20). 29 refs. [Rum.f.] From *abstr.* in *J. appl. Chem.* 9 (12), 1959 (ii–617). O.R.S.

The optimum tree age and conditions of extraction for *Salix caprea* are given, with data on tannin, non-tannin, glucose and sucrose contents.

2586. PEARL, I. A., *et al.* **Studies on the barks of the family Salicaceae. III. The alkaline hydrolysis of barks of several species of the genus *Populus*.** *Tappi* 43 (9), 1960 (756–8). 8 refs. P.R.

[Cf. *F.A.* 21 No. 3865.] In the present investigation, phenolic acids were the main product of alkaline hydrolysis of the bark of *P. tremuloides*, *P. tacamahaca*, *P. deltoides*, *P. trichocarpa*, and *P. heterophylla*, all of which also yielded vanillin, syringaldehyde, *p*-hydrobenzaldehyde, acetovanillone, acetosyringone, and vanillic, syringic, ferulic, *p*-hydroxybenzoic and *p*-coumaric acids. The presence of a number of unidentified non-phenolic compounds was indicated by qualitative paper chromatography.

892.5. Christmas Trees. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 1684, 1884.

2587. CHOPRA, I. C., ABROL, B. K., and HANDA, K. L.; PARIS, R., and DILLEMANN, G. **Medicinal plants of the arid zones. Part 1. With particular reference to the botanical aspects. Part 2. With particular reference to the pharmacological aspects.** *Arid Zone Research, UNESCO, Paris* No. 13, 1960 pp. 96. 190 refs.

2588. SHAH, C. S., and BHATTACHARYYA, A. R. **Pharmacognostic study of *Albizzia lebbek* Benth. bark.** *J. sci. industr. Res. India* 19*C* (8), 1960 (199–202). 14 refs. P.O.

Describes the morphological and microscopic characters of young stems and old bark of *A. lebbek*, and discusses the determination of the saponin content of the bark from its froth number and the estimation of its haemolytic index. The drug is shown to possess anthelmintic activity.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also No. 1879.

2589. MIROV, N. T. **Biochemical geography of the genus *Pinus*.** *Abstr.* in *Proc. 9th Int. Bot. Congr., Montréal* Vol. 2, 1959 (265). O.B.D.

Volatile oils (turpentines) obtained from oleoresins of 94 *Pinus* spp. were analysed, and the pattern of the geographical distribution of the chemical components mapped. A pattern of distribution has been established for α-pinene, β-phellandrene, Δ^3-carene (all three $C_{10}H_{16}$), two sesquiterpenes ($C_{15}H_{24}$), a diterpene ($C_{20}H_{32}$), paraffin hydrocarbons, chiefly *n*-heptane (C_7H_{16}), and aliphatic aldehydes. In general, the same or very similar substances are found in western America and eastern Asia, on both sides of the Pacific. This relationship appears to indicate that the centre of origin of the genus *Pinus* was the now non-existent land mass that lay between northern parts of America and Asia. Furthermore it appears that a majority of the European species of the genus arrived at their present locations via N.E. America, whereas *P. sylvestris* and *P. peuce* came to Europe from the east across Asia. There is chemical evidence of an ancient hybridization between *P. sylvestris* and some eastern Mediterranean Pines.

2590. SANDERMANN, W., and SCHWEERS, W. Über die Biogenese von *n*-Heptan in *Pinus jeffreyi* Murr. **[The biogenesis of *n*-heptane in *P. jeffreyi*.]** *Chem. Ber.* 93 (10), 1960 (2266–71). 9 refs. [G.g.] P.R.

The fact that introduction of radio-active mevalonic acid into young plants (in aqueous solution absorbed via cuts in needles) did not produce radioactive *n*-heptane, whereas the introduction of radioactive Na acetate did so, indicated that the *n*-heptane (which in the turpentine of this species forms up to 98% of the volatile fraction) is not derived from a terpene compound but is a product of acetate metabolism like fatty acids. [Cf. *F.A.* 18 No. 4786; 20 No. 1424.]

2591. BARDYSCHEW [BARDYŠEV], I. I., and ROMAN, L. W. [L. V.]. **[Investigation of the composition of the turpentine and the properties of rosin from *Pinus pithyusa* var. *stankewiczii* Suk.,**

Pinus stankewiczii **Fom.]** *Ž. prikl. Him.* 31, 1958 (1762–5). [Russ.] From *abstr.* in *Holzforschung, Berlin* 14 (4), 1960 (125). [G.] P.R.

The crude resin, turpentine, and rosin are all similar to those of *P. sylvestris*.

2592. SMIRNOV, B. P., and SIDOROV, V. S. Hromatografija na bumage smoljanyh kislot sosny i eli. **[Paper chromatography of resin acids of *Pinus sylvestris* and *Picea abies*.]** *Ž. prikl. Him.* 33 (5), 1960 (1192–1203). 19 refs. [Russ.] P.O.

Using the method described, the acids of Pine and Spruce were methylated with C^{14}–H_2N at room temperature in ether. The esters of abietic and *l*-pimaric acids were separated. An unidentified fraction was isolated, but sapinic acids were not identified.

2593. **Pine oleo-resin from British Honduras.** *Extr.* from *Rep. Trop. Prod. Inst., Lond. 1959*, 1960 (3–4).

Analysis of a sample of turpentine of *Pinus caribaea* from British Honduras showed it to contain >70% of α-pinene vs. 64% in *P. elliottii* from the U.S.A.; it had a lower % of β-pinene (ca. 5%) and quantities of myrcene and β-phellandrene. The resin obtained from this specimen was very clear and pale.

2594. MCGIMPSEY, J. R., and MURRAY, J. **Essential oils of New Zealand Podocarpaceae. II. *Podocarpus spicatus*.** *J. appl. Chem.* 10 (8), 1960 (340–4). 18 refs. O.R.S.

Samples of *P. spicatus* essential oil from different parts of New Zealand are compared and shown to differ only in the terpene alcohol and diterpene constituents. The compounds identified in the oil are α-pinene, myrcene, α-terpinene, β-phellandrene, dipentene, γ-terpinene, *p*-cymene, α-terpineol, aromadendrene, a selinene, cadinene, and kaurene or phyllocladene. The substance known as 'γ-podocarpene' is a diterpene alcohol. [Cf. *F.A.* 13 No. 4427.] *From authors' summary.*

2595. OLIVER, B. **Nigeria's useful plants. Part III. Plants yielding essential oils.** *Nigerian Field* 25 (4), 1960 (174–92). 3 refs.

Descriptive notes on plants and (*a*) their oils, from leaves and stems (18 spp.), grasses (6), flowers (12), fruits (5), seeds (5), miscellaneous (7); (*b*) flavouring agents from roots (4), seeds (5), leaves and stems (2); and (*c*) aromatic resins (5). [Cf. *F.A.* 21 No. 3866.]

2596. CAMBIE, R. C., and SEELYE, R. N. **Note on the identification of Manuka manna.** *N.Z. J. Sci.* 2 (4), 1959 (498). 3 refs.

The colourless, crystalline water-soluble compound found on *Leptospermum scoparium* and associated with the nymphal form of *Scolypopa australis* and the larva of *Aemona hirta* has now been identified as *d*-mannitol.

2597. GOTTLIEB, O. R., and MAGALHÃES, M. TAVEIRA. **Essential oil of the bark and wood of *Aniba canellila*.** *Perfumery & Essential Oil Record, London* 51, 1960 (69–70). From *abstr.* in *Chem. Abstr.* 54 (15), 1960 (15830). P.R.

The oil of *A. canellila* bark contains ca. 1% eugenol, 15% methyl eugenol, and 80% 1-nitro-2-phenylethane, the latter also being the main constituent of the oil in the wood, which also contains small amounts of eugenol.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 1484, 1864–6.

2598. COUTINHO, L. PEREIRA. O valor da leguminosa *Samanea saman* (Jacq.) Merr. **[The value of *S. saman*.]** *Gazeta do Agricultor, Lourenço Marques* 11 (120), 1959 (130–1). [Port.] C.G.B.

A chemical analysis of the fruit, a valuable fodder material, shows that it has a high protein (16·85%) and carbohydrate (45·33%) content, the latter containing a high % of sugars. The % of fat is higher in the seed (6·91) alone than in the fruit as a whole (2·44).

2599. SOMBHONGPAN, V. **[Collection of Tao [*Arenga pinnata*] fruits.]** *Vanasarn* 18 (1), 1960 (62–5). [Siam.]

Describes the Palm, which is restricted to the cooler and damper (mountain) regions of the country, and which can be found in fruit at all times of the year, according to age. In summer its utilization is hampered by lack of water for steeping the fruits. The seed is made into a popular preserve, after soaking in a sugar solution and evaporation; the process is described.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

2600. Memoria sobre las actividades de este centro en el año 1959. **[Report on the work of the Department of Forests, Hunting and River Fishing for 1959.]** Dirección General de Montes, Caza y Pesca Fluvial, Ministerio de Agricultura, Madrid. 1960. pp. 107 + 35 photos. [Span.]

902. History of Forests and Forestry

See also Nos. 1644, 1844.

2601. EDLIN, H. L. **Norse names for trees and woods on the maps of Britain.** *Quart. J. For.* 54 (4), 1960 (351–6). [Cf. *F.A.* 20 No. 5391.]

2602. 400 metų nuo Lietuvos girių surašymo. **[400-years' anniversary of forest inventory in Lithuania.]** *Girios Aidas, Chicago* No. 17, 1959 (79–81). [Lith.e.]

A brief account of the first forest inventory, conducted by Gregorius Valavicius at the order of King Zigmantas Augustas. It is not known how long the inventory took, but it was completed in 1559 and copies of the inventory still extant show that it included a great deal of information about the forests, roads, boundaries, the haunts of the larger wild animals and the rights and privileges of individuals; and that the forests (then almost entirely State-owned) were managed according to written regulations, indicating the great value of wood and other forest products. The inventory describes 38 forest tracts, extending from the Nemunas [Niemen] river and the city of Kaunas southwards to the Pripet marshes and vicinity of Kiev.

903. Forest Policy, General

See also No. 2297.

2603. JENNINGS, A. C. S. **The rôle of private forestry in the national programme [of Great Britain].** *J. Oxf. Univ. For. Soc.* (*5th Ser.*) No. 8, 1960 (18–26).

2604. KERESZTESI, B. Hogyan teljesítük a magyar erdögazdaság elsö fejlesztési tervét? **[The fulfilment of the first development plan for Hungarian forestry.]** *Erdö* 7 (2), 1958 (51–64). [Hu.] From *abstr.* in *Hung. agric. Rev.* 7 (3), 1958 (7). [E.] C.G.B.

Reviews the work done in the 3½ years since Resolution No. 1040 of the Council of Ministers of the Hungarian People's Republic (27 June 1954) and the tasks remaining in 1958–60.

2605. HALÁSZ, A. Fafelhasználásunk és faellátásunk helyzete. **[The position in our utilization and supply.]** *Erdö* 7 (10), 1958 (379–400). [Hu.russ.g.]

A basic problem in the improvement of Hungary's economy is the security of the timber supply [which is analysed by assortments in relation to Europe as a whole]. The tasks of the logging and timber industries in this are defined. Most important is planned use of the growing stock, particularly as regards better storage and preparation of pulpwood, raising of the plywood fraction and closer liaison between forest management and industry.

2606. CHINOPOULOS, D. Programma oikonomikēs anaptyxēos tēs oreinēs Eurytanias. **[Economic development programme of the mountainous district of Evritania.]** *Das. Chron.* 2 (17), 1960 (763–6). [Gk.]

Includes some description of the forestry of the district, with a few statistics (ca. 768,836 stremmas of forests, of which 465,000 are predominantly Fir and under State management), and the author's proposals and financial estimates for co-ordinated land use.

904. General Regional Accounts of Forests and Forestry

2607. **Forests of Czechoslovakia.** State Agricultural Publishing House, Prague. 1960. pp. 224 + 1 tbl., 10 maps, 1 gph., 1 dgm. [E.]

Describes the present state of the forests, their management and administration, research, etc., supported by maps and many photos, including some of the 42 protected virgin forests.

2608. POVEDANO ALONSO, F. Repoblación forestal. **[Afforestation.]** *Bol. Inform. Minist. Agric., Madrid* 13 (81), 1960 (56–63). [Span.]

Presents a short survey of the forests of Spain, their resources and history, and reviews the work achieved by the Patrimonio Forestal in afforestation, fire control, and the establishment and maintenance of nurseries. Problems connected with grazing and with the establishment of boundaries are also briefly discussed.

2609. HUECK, K. Reisebeobachtungen 1960 über die Aufforstungen im Israel. **[Study tour observations, 1960, on afforestation in Israel.]** *Forstwiss. Cbl.* 79 (9/10), 1960 (257–69). 12 refs. [G.]

History, administration, climate and plant geography, and afforestation in Galilee, Carmel, Menashe, the coastal dune region, Hadera, the Jerusalem corridor, and the Negev.

2610. **Forestry**. *Extr.* from *Report: Cayman Islands, H.M. Stationery Office, London 1957/58*, 1960 (21). O.I.C.S.

Principal forest products are Mahogany and *Thrinax argentea* (the Thatch Palm which provides the raw material for the thatch rope industry). There is no apparent need for any active forest policy, and none is in effect.

2611. **Forestry**. *Extr.* from *Rep. Bahamas, Lond. 1956/57*, 1959 (20–5). O.I.C.S.

The present trend is towards Pine pulpwood (30-year rotation) in place of lumber production. Tabulated data are given on the areas and types of forests, and the policy and methods of management are outlined. Organized forest industry is confined to the Pine forests, which produce lumber for home consumption and pulpwood for export (statistics tabulated). The structure of the forestry department is outlined.

2612. **Forestry**. *Extr.* from *Report: Antigua, H.M. Stationery Office, London 1957/58*, 1960 (25). O.I.C.S.

Forest areas are limited, and mostly privately owned. Main products are fuelwood and charcoal.

2613. **Forestry**. *Extr.* from *Report: British Virgin Islands, H.M. Stationery Office, London 1957/58*, 1960 (24). O.I.C.S.

A brief account of the preservation and conservation of the few existing fragments of forest.

2614. **Forestry**. *Extr.* from *Report: Dominica, H.M. Stationery Office, London 1957/58*, 1960 (24–5). O.I.C.S.

A brief account of forests and forestry, listing the main exploitable timbers.

2615. **Forestry**. *Extr.* from *Report: Montserrat, H.M. Stationery Office, London 1957/58*, 1960 (15–6). O.I.C.S.

A brief account of staffing and estimated fellings.

2616. **Forestry**. *Extr.* from *Report: St. Kitts—Nevis—Anguila, H.M. Stationery Office, London 1955/56*, 1958 (26). O.I.C.S.

The forest areas are regarded entirely as protective and very little exploitation is allowed.

2617. **Forestry**. *Extr.* from *Report: Grenada, H.M. Stationery Office, London 1955/56*, 1958 (22). O.I.C.S.

A brief account of the forests and forestry. No systematic exploitation is attempted.

2618. **Forestry**. *Extr.* from *Report: St. Lucia, H.M. Stationery Office, London 1955/56*, 1958 (33–4). O.I.C.S.

Data on amounts of timber felled and extracted, imports, and exports.

2619. DUPLAQUET, L. La Trinité à l'avant-garde de la sylviculture caraïbe. **[Trinidad in the forefront of Caribbean forestry.]** *Rev. for. franç.* 12 (10), 1960 (622–7). [F.]

Observations made in the course of a recent visit.

2620. FARNSWORTH, C. E. **Forestry in the Philippines**. *Iowa St. Coll. J. Sci.* 34 (4), 1960 (559–64). O.R.E.

A short account covering forest types (especially the Dipterocarp type), logging, export of logs, land use, protection, etc.

2621. **[Forestry in] New Hebrides**. *For. Adv. Newslett. Colon. Off., Lond.* No. 8, 1960: *Appendix A* (1–2). 1 ref. in text. *Restricted.* I.F.B.

The total area of the Anglo-French condominion is ca. 5700 sq. miles. The northern islands have mixed tropical hardwood forest including *Intsia bijuga*, *Castanospermum australe*, *Pometia pinnata*, *Gyrocarpus americanus*, *Acacia spirorbis*, *Dracontomelum sylvestre*, *Pterocarpus indicus*, *Calophyllum inophyllum*, *Heritiera littoralis*, and *Agathis* sp. The main economic crop is coconuts. In the southern, somewhat drier, islands there are important stands of Kauri (*Agathis obtusa*) and Tamanu (*Calophyllum neo-ebudicum*), particularly on Erromanga, where these two species form 95% of the crop. Other species are *Santalum austrocaledonicum*, *A. spirorbis*, and *Homalium* sp. Kauri has been exploited on Anetum island; trade in Sandalwood has declined as the larger trees were cut, but continues on a small scale. In 1959, imports of timber were valued at £32,000. All land is native-owned. There are no forestry activities or legislation. [Cf. *F.A.* 15 No. 4400.]

2622. **Forestry**. *Extr.* from *Report: New Hebrides, H.M. Stationery Office, London 1957/58*, 1960 (26). O.I.C.S.

The whole group is heavily wooded, but surveys so far have shown that the many useful stands of timber are usually too isolated to permit of economic extraction.

2623. **Forestry**. *Extr.* from *Report: Gilbert and Ellice Islands Colony, H.M. Stationery Office, London 1956/57*, 1959 (28). O.I.C.S.

The amount of usable timber is small and that available and cut for local use is not of commercial importance.

2624. **Forestry**. *Extr.* from *Report: Tonga, H.M. Stationery Office, London 1956/57*, 1959 (25–6). O.I.C.S.

A brief account of existing forests, timber imports, sawmilling and small-scale re-afforestation in the Tonga Islands. [Cf. *F.A.* 22 No. 1246.]

905. Forest Statistics and Resources

See also No. 2602.

2625. ILVESSALO, Y. Suomen metsät kartakkeiden valossa. **[The forests of Finland in the light of maps.]** *Commun. Inst. For. Fenn.* 52 (2), 1960. pp. 70 + 30 maps. Many refs. [Fi.g.e.*e.*]

Contains 30 maps portraying land utilization, forest types, swamps, species dominance, age classes, growing stock, increment and site class, based on the Third Finnish Forest Survey and discusses the main principles adopted in their preparation [cf. *F.A.* 20 Nos. 1307–8].

2626. HOLOPAINEN, V. Suomen metsien luovutusmäärä hakkuuvuosina 1955/56—1956/57. Hakkuutilaston metodia käsittelevä koetutkimus. **[Outturn from Finnish forests in the felling years 1955/56—1956/57. A study in the method of compiling felling statistics.]** *Silva fenn.* 97 (2), 1959. pp. 41. 10 refs. [Fi.e.*e.*]

2627. WILSON, R. C., and VITAS, G. **The United States timber situation**. *Unasylva* 14 (3), 1960 (104–14). 3 refs.

2628. FINDELL, V. E., *et al.* **Michigan's forest resources**. *Sta. Pap. Lake St. For. Exp. Sta.* No. 82, 1960. pp. iv + 46.

Summarizes the results of a survey conducted between 1946 and 1957, with notes on future timber production, survey methods and their accuracy, and principal tree species recorded.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116 and No. 2635.

2629. BERGAS, V., *et al.* [Editors]. Vtoroe Vsesojuznoe Soveščanie po Ohrane Prirody. **[The Second All-Union Conference on Nature Protection.]** Akademija Nauk Litovskoj SSR, Vilnius. 1960. pp. 188. [Russ.]

Comprises the 36 short general papers read at the conference, covering all aspects of the protection and conservation of nature in all the Republics of the U.S.S.R.

2630. PERN, L. K., and GUSEV, N. N. Vozrasty lesovosstanovitel'nyh rubok v zelenoj zone g. Moskvy. **[The age for starting regeneration fellings in the Moscow green belt.]** *Lesn. Hoz.* 12 (3), 1960 (55–8). [Russ.]

For Scots Pine, 121 years; Oak, 101 years; Birch, 71 years; coppice Birch, 50–60 years; Spruce, 91 years; Aspen, 41–50 years, or, in very defective stands, 31–40 years.

2631. **Society of American Foresters natural areas**. *J. For.* 58 (11), 1960 (905–17). 2 refs.

Lists (alphabetically, by states) the 128 protected areas approved as of 1 Jan. 1960, showing mean age of each forest type, mean height and diameter of the principal species within each type, and the elevation, topography and geology of each area. [Cf. *F.A.* 15 No. 4411.]

2632. METZ, L. J. **The de la Howe old-growth forest in Piedmont Shortleaf Pine.** *J. For.* 58 (10), 1960 (807–8, 810).

Briefly describes a preserved tract of *Pinus echinata* >160 years old. Fertile, well drained, and free from littleleaf disease, it contrasts sharply with the many second-growth heavily diseased stands on eroded and poorly drained sites in the S. Carolina Piedmont.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also No. 1845.

2633. FORSSTRÖM, M. Maanhankintalain ja siihen liittyvien lakien toimeenpanon vaikutuksista valtion metsälouteen. **[The effect of measures taken under the resettlement laws and similar enactments on the State forests of Finland.]** *Silva fenn.* 104 (1), 1960. pp. 50. 52 refs. [Fi.g.]

Gives statistics on the area, growing stock, and value of the alienated lands, and the consequences to employment and taxation. The area involved was 1 million ha., or ca. 10% of the State forest land.

2634. Flurholzanbau und Ödlandaufforstung. **[The growing of timber outside the forest and the afforestation of waste land.]** *Allg. Forstzeitschr.* 15 (39), 1960 (561–75). [G.]

A special number, including articles on: The support of waste land afforestation from public funds (*Künneth*); The conversion to high forest of the Siegerländer *Hauberge* [communally owned coppice with agricultural intercropping] (*H. Mudrich*); The use of machines in afforesting waste lands and clear fellings [reviewing a book of that title by *E. Burckhardt* cf. *F.A.* 19 No. 1622] (*Liebeneiner*); Enriching flood-plain forests in Upper Austria [chiefly with Poplars and Willows] (*Rettelbach*) etc.

92. Forest Ownership and Ownership Policy

See also No. 2603.

2635. RUPPERT, K. Der Stadtwald als Wirtschafts- und Erholungswald. **[The municipal forest and its use for production and recreation.]** BLV Verlagsgesellschaft, Munich. 1960. pp. 174 + 52 photos and maps. [G.] Price *DM.* 24. From *review* in *Holz-Zbl.* 86 (124), 1960 (1748). [G.]

A description of the municipal forest of Frankfurt-am-Main. Of its 5000 ha., ca. one-third is managed mainly for recreation, with footpaths, playgrounds, etc. In the rest, though it is managed for production, the interests of the Water Board (water from the river is pumped into the forest to enrich the groundwater and thereby increase supplies of drinking water for the city), and of wild life are prominent. No financial surpluses are aimed at, and the necessary subsidy is considered to be justified from the point of view of general welfare.

2636. **Farmers' forestry in Sweden.** Sveriges Skogsägareföreningars Riksförbund, Stockholm. 1960. pp. [24]. [E.]

An illustrated pamphlet covering forest resources and their exploitation, ownership and utilization, the associations of forest owners and the work of the National Federation of Swedish Forest Owners' Associations.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 1507, 1648.

2637. **Legislative Council of Tanganyika Sessional Paper No. 30 of 1957. An Ordinance to consolidate and amend the law relating to the conservation and management of forests and forest produce and to amend the Mining Ordinance. Parts I–XI.** Government Printer, Dar-es-Salaam. 1957. pp. 22 + 2.

2638. **The Laws of British Guiana in force on the 1st day of July, 1953. Revised Edition. Chapter 240: Forests. An ordinance to consolidate and amend the law relating to forests.** Chief Secretary, Georgetown, British Guiana. 1954. (3268–82).

2639. VIPULANUSASANA, P. **[Office of the Legal Adviser [to the Forest Department].]** *Vanasarn* 18 (2), 1960 (65–9). [Siam.]

Gives some account and discussion of this Office, which was formed in 1958, on the lines of others in Ministries and other Government departments, in order to deal more effectively with cases brought by members of the public against forest personnel or the Department itself, e.g. for alleged breach of contract. Previously, recourse was had to the State Legal Department, but cases have of recent years increased in number and complexity sufficiently to justify the new Office which should be in a position often to launch prosecutions itself, instead of waiting to be prosecuted, as well as to collect facts in aid of the State Legal Department when called for.

2640. Metsänhoitoyhdistyslain tarkistamiskomitean mietintö. **[Report of the committee set up to revise the law on forestry associations.]** *Silva fenn.* No. 98, 1958 (1959). pp. 46. [Fi.e.]

The Finnish law on forestry associations, which came into force in 1952 [cf. *F.A.* 16 No. 4849], obliged forest owners to pay the so-called forestry fee to finance the activities of local forestry associations. The present report reviews the effect that this law has had on private forestry, and recommends some amendments.

94. Other Methods to Implement Forest Policy

944. Co-operation. Collaboration of Forest Owners

2641. DALVI, M. K. **Co-operatives for forest management and marketing of timber products.** *Indian For.* 86 (9), 1960 (559–62).

Describes an experiment in forest labourers' co-operatives in Bombay, started in 1945 with the aim of raising the economic status of the labourers and at the same time inculcating conservation principles.

945.1. Advisory and Information Services, Documentation Centres

2642. Nix, L. A. **Forestry consulting in Canada.** *For. Chron.* 36 (3), 1960 (252–9).

Reviews numbers, professional standing, income, activities etc. of private forestry consultants.

2643. **A synopsis of the work and growth of the Commonwealth Forestry Bureau, Oxford, 1939–1959.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., England. 1960. pp. 27. Price 2*s*. 6*d*.

945.2. Publicity, Propaganda (including Demonstration Forests)

2644. **Mobile forestry exhibit in Ethiopia.** *Unasylva* 14 (3), 1960 (125–8). 8 refs.

Reproduces a number of diagrams included in the exhibition, the object of which was to arouse awareness of the destruction of forests by fire, uncontrolled felling, and nomadic agriculture.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also No. 2306.

2645. **World directory of forestry schools.** Society of American Foresters, Washington, D.C. 1960. pp. xiv + 298. Published in collaboration with FAO. Price $5.50.

A revised edition of the FAO Directory of Forestry Schools, 1953 [cf. *F.A.* 15 No. 2165].

945.4. Research

See also No. 2309.

2646. Sukačev, V. N., and Molčanov, A. A. [Editors]. Issledovanija v Tellermanovskom opytnom lesničestve. **[Investigations in the Tellerman Experimental Forest.]** *Trud. Inst. Les.* No. 33, 1957. pp. 197. Many refs. [Russ.]

Ten papers: A programme of research on "The scientific basis of management in Oak forests maintained for water conservation in the forest-steppe zone" (*A. A. Molčanov*); Forest types in the Tellerman forest massif (*A. P. Petrov*) [distinguishing and describing 13]; Phenological observations in 1952–53 in the Tellerman Experimental Forest (*I. N. Elagin*) [in four forest types]; Crown cover in Oak forests (*I. N. Elagin*) [using a method already described—see *F.A.* 14 No. 3603]; Air temperatures for the start of sap flow in *Acer platanoides* and *Betula verrucosa* (*I. N. Elagin*) [sap flow generally starts when afternoon temperatures are 0° C. or 1–2 degrees above]; The effect of tree and shrub coppice on artificial regeneration of Oak (*K. V. Zvorykina*) [with particular regard to the light regime]; Some biological characters of *Acer campestre* (*K. V. Zvorykina*) [regeneration by natural layering, leaf weight, root system, etc.]; The herbaceous cover on clear fellings, and its effect on natural regeneration of tree species and on artificial regeneration of Oak in the Borisoglebsk forest massif (*A. A. Matveeva*); Changes in the herbaceous cover in Oak forests with stand age (*G. L. Remezova*); The foliage of Aspen stands in the Tellerman forest (*V. V. Smirnov*) [tabulated data on the number of leaves, leaf moisture content, and foliage weight and area in stands 5–63 years old].

2647. Bukštynov, A. D. Nekotorye itogi rabot Vsesojuznogo naučno-issledovatel'skogo instituta lesovodstva i mehanizacii lesnogo hozjajstva. **[Some results of the work of VNIILM.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (5–21). 1 ref. [Russ.]

A survey of the work of the Institute from the 1930's to the present.

2648. Valk, U. [Editor]. **Forest research in the Estonian SSR.** Akademija Nauk Estonskoj SSR, Tallin. 1960. pp. 63 + 32 plates. Many refs. [E.]

The pamphlet gives a short survey of forest research work carried out in Estonia since the war. Various specialists have written the separate chapters (each of which has its own bibliography): the scope of investigations and main lines of research; soil science; dendrology; forest typology; plantation establishment; thinnings; phytopathology; entomology; mensuration and management; utilization; game management; nature conservation; and the complex [ecological] study of forests (following V. N. Sukačev's principles): alvar, heath, swamp [bog], and grove forests.

2649. Ivanenko, B. I. Voprosy lesnogo hozjajstva v gornyh lesah Kryma, Kavkaza i Karpat. **[Forestry in the montane forests of the Crimea, Caucasus and Carpathians.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 40, 1960 (22–32). [Russ.]

Surveys post-war research and experiment, and lists the main research tasks for the future.

2650. **Forest research review, year ended March 1960.** British Columbia Forest Service, Vancouver, B.C. 1960. pp. 56.

Reviews current research in British Columbia, with progress reports on many of the projects.

2651. Baskerville, G. L., Hughes, E. L., and Loucks, O. L. **Research by the Federal Forestry Branch in the Green River Project.** *For. Chron.* 36 (3), 1960 (265–77). 15 refs.

Reviews progress in the first 15 years of the project. [Cf. *F.A.* 17 No. 1881; 21 No. 4230.]

946.1. Associations, Societies

See also No. 2640.

2652. Hosmer, R. S.; Clepper, H. **The Society of American Foresters: an historical summary. Part I: The first half century (1900–1950). Part II: The past decade (1951–1960).** *J. For.* 58 (10), 1960 (765–79).

To mark the 60th anniversary of the Society's foundation. [Cf. *F.A.* 13 No. 834.]

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also No. 1889.

2653. Savinkov, S. M. Sokraščennyj rabočij den′ i novye uslovija oplaty truda v lesnom hozjajstve. **[A shorter working day and new wage schemes in forestry.]** *Lesn. Hoz.* 12 (3), 1960 (43–6). [Russ.]

A short discussion of the new tariffs and wage scales in the U.S.S.R.

2654. Zimmermann, G. Löhne und Gehälter in der sowjetischen Forstwirtschaft. **[Wages and salaries in Russian forestry.]** *Holz-Zbl.* 86 (124), 1960 (1746–7). [G.]

Presents data from [unspecified] Russian sources on the remuneration of various grades of monthly paid personnel and of daily and hourly rates for various workers, after the introduction of the 42-hour week, on premium and incentive systems, supplementary pay for difficult conditions (particularly for working in severe climates), taxes, etc.

2655. Gusovius, H. Waldarbeiter und landwirtschaftlicher Nebenerwerb. **[Forest workers and part-time husbandry.]** *Allg. Forstzeitschr.* 15 (44), 1960 (629–30). 2 refs. [G.]

Based on a thesis investigating the conditions of the many regular forest workers who farm small holdings as owners or tenants (e.g. in Hesse, 49% farmed >1 ha.). The reasons for this system, traditional in many areas, are as much social as economic, and though the combination of farming and paid employment presents problems to the worker—overwork and conflict of interests—and to the forest owner, who naturally tends to plan for full employment of a small skilled labour force, it ensures the maintenance of a healthy rural population and a supply of willing workers.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences, Excursions

See also No. 1628.

2656. Voprosy lesovedenija i lesovodstva. (Doklady na V Vsemirnom Lesnom Kongresse.) **[Forestry and silviculture. (Papers [of Soviet delegates] at the 5th World Forestry Congress).]** Akademija Nauk SSSR, Moscow. 1960. pp. 476. [Russ.E.]

Contains 30 papers on many aspects of forestry, of which 7 are separately noticed in this issue of *F.A.*

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References: 1. *American Forests*, Washington; 2. *Angewandte Chemie*, Frankfurt am Main; 3. *British Columbia Lumberman*, Vancouver; 4. *F.A.O. Press Release*, Rome; 5. *Financial Times*, London; 6. *Finnish Paper & Timber*, Helsinki; 7. *Forestry Commission Press Release*, London; 8. *Forêt*, Neuchâtel; 9. *Holz-Kurier*, Vienna; 10. *Industrial & Engineering Chemistry*, Washington; 11. *I.U.C.N. Bulletin*, Brussels; 12. *Ministry of Agriculture Press Release*, London; 13. *Nature*, London; 14. *Newsletter, N.Z. Forest Service*, Wellington; 15. *Pulp & Paper Magazine of Canada*, Gardenvale, Quebec; 16. *Southern Lumberman*, Nashville, Tennessee; 17. *Timber and Plywood*, London; 18. *Timber Trades Journal*, London; 19. *Topola*, Belgrade; 20. *Wood*, Chicago; 21. *Wood Preserving News*, Chicago.

International Conferences

1961

27 Aug.–2 Sept.	10th Pacific Science Congress	Honolulu
9–15 Sept.	13th Congress of the International Union of Forest Research Organizations	Vienna

1962

2 May	14th International Symposium on Crop Protection	Ghent
19–25 Aug.	International Congress of Microbiology	Montreal

FAO Conferences

1961

10–16 May	1st FAO Conference on Plant Protection in the Near East	Damascus
22–26 May	11th Session European Forestry Commission	Rome
July	1st Session North American Forestry Commission	Mexico City
14–26 Aug.	2nd World Eucalyptus Conference	São Paulo, Brazil
7–12 Oct.	3rd Session Near East Forestry Commission	Iraq

International. The International Union for the Conservation of Nature & Natural Resources (I.U.C.N.) has launched an 'African Special Project', as an attempt, based on sound ecological principles, to save the remaining large mammals in tropical African areas, with the assistance of the native populations. A conference arranged jointly by I.U.C.N. and the Scientific Council for Africa South of the Sahara (C.S.A.) is to be held (probably in Tanganyika) in Sept. 1961 to discuss: the present role of the natural resources of wild lands in local economy and the possibilities of its increase; research, conservation, and development; the integration of the conservation and development of wild resources with programmes of economic development in modern states; mass education in nature and natural resources; and, finally, international projects, such as a list of national parks, revision of the 1933 Convention, etc. (**11**; Dec. 1960).

The aim of the symposium on the utilization of small wood, held in Geneva in March 1961, was to find ways of supplying wood, e.g. from hardwood coppice, to industry at an economic price. Problems studied were how to raise the efficiency of harvesting and transport of small wood so as to lessen the cost to the consumer while at the same time making it an economic crop for the producer to grow and harvest, and how to determine the consumers' preferences and requirements in the form in which small wood is supplied and the methods of supplying it to them. The meeting was followed by a one-week study tour in France and the U.K. on the rationalization of harvesting and transport of small wood and on its use by the pulp and paper industries (**4**; 6.1.61).

Australia. A novel method of treating veneers with preservative involves the use of a sprinkler assembly fitted to the pressure-bar holder on the rotary lathe. The jets are directed to spray one face of the veneer as it is peeled from the log. As it comes off the lathe, the veneer is cut into sheets, which are stacked, still wet, until osmosis takes place and both veneer faces are saturated. Minimum stacking time is 3 hours. The preservative used is a solution of Na borate, and the retention attained is 0·2% of the dry weight of wood (**20**; Jan. 1961).

Austria. An Austrian has invented a circular saw (the 'Hochwald') with a specially shaped tooth line which is said to push away the hand feeding wood to the saw if it should come too near, thus making the saw accident-proof (**9**; 23.2.61).

Canada. The B.C. Forest Service has carried out tests to see whether a fire-fighting hose can burn while cold water is passing through it. It was found that latex- or rubber-lined hose will burn, whereas unlined linen hose will not, as long as water is passing through (**15**; Nov. 1960).

Eskimos have received with much favourable comment the Government's transition house, of which 125 units have been in use for a year in 14 settlements. The house, designed by the British Columbia Plywood Association, the university agricultural engineers, and the National Research Council, is constructed of Fir plywood sheathing, insulated by 4 in. of rock wool, covered with a vapour barrier of polythene, and supported on a rigid frame. Cost of materials is $500 in Montreal. The house is extendable by 4-ft. units (**3**; May 1960).

Finland and Norway. An agreement has been prepared, after investigations commissioned by the Finnish and Norwegian governments, on the development of economic relations by making joint use of the natural resources of the northern area. A central point of the plan is the establishment of a Finnish-Norwegian mill for the production of kraft paper near Kiskenes in Sör-Varanger, Norway. The mill is planned for a production capacity of ca. 64,000 tons of unbleached sulphate cellulose or 60,000 tons of kraft paper a year. The timber would come chiefly from the Finnish state forests in the Inari district. The establishment will be managed by a joint stock company subject to Norwegian law and each state will subscribe one half of the share stock (**6**; Sept. 1960).

Great Britain. To further the aims of the FAO World Seed Campaign [see *F.A.* 21 p. 330], the Forestry Commission propose to hold a special course on forest genetics, tree breeding, and seed production at Netherwood House in the New Forest, 9–13 Oct., 1961. Ten places on the course are intended for landowners, forestry consultants, members of the seed and nursery trade and experienced foresters in Britain, and a similar number is being reserved for experienced forest officers from other countries. Lectures will be given on provenance research, selection and breeding, the physiology of flowering and seed production, methods of increased seed production in the forest, seed extraction and testing, and the application of test data in nursery practice. The course will be followed by a 7-day tour of Commission and private forests (**7**; 11.3.61).

The Ministry of Agriculture has recently reconstituted the Bedgebury Pinetum Committee and revised its terms of reference, which now are to advise the Minister (as responsible for both the Forestry Commission and the Royal Botanic Gardens, Kew) on the management, maintenance, and development at Bedgebury of as large a representative collection of coniferous trees as possible, for scientific study, for use as a reference collection by conifer growers,and for initial testing of possible economic value. The Bedgebury Pinetum was established nearly 40 years ago and now covers ca. 90 acres. It contains Pines and other conifers from almost all the temperate regions of the world (**12**; 10.2.61).

Rostherne Mere and some surrounding woodland in N. Cheshire have been presented to the Nature Conservancy, and the area is to be declared a National Nature Reserve. The hydro-biology is of considerable interest and the area is a winter resort for wildfowl as well as a breeding place for certain aquatic birds (**13**; 18.2.61).

The Nature Conservancy has declared a new National Nature Reserve of 1363 acres at Invernaver on the N.E. coast of Sutherland. It includes woodland, heath, and sand-dunes (**13**; 18.2.61).

Purley Timber and Trading Co. Ltd. have recently brought out the first plywood swimming pool to appear on the British market. Designed to withstand great water pressures, the "Purley Pool" is offered in sizes ranging from the smallest garden pool (10 × 8 × 2½ ft.) to a school or factory model (41 × 25 × 3 ft.). The pool is erected above ground, and consists basically of 4 Douglas-Fir plywood cavity walls, corner-locked with steel locking bars, and lined with heavy PVC. All wood used is pressure-impregnated with Celcure, which is said to afford adequate protection against weather, splash water, and contact with earth (**17**; 29.12.60).

As its orders for wooden heels continue to dwindle, the Beech trade is beginning to feel well and truly stabbed in the back by the unabating popularity of the stiletto heel. This, however, is a sentiment not entirely shared by the hardwood-floor manufacturer, on whom the persistent fashion is making its mark to very different effect. Throughout the land the floors of shops, offices, dance-halls, and private houses—guaranteed, it was fondly thought in pre-stiletto days, to outlast the buildings themselves—are disintegrating at record speed, with the consequent upsurge of orders for their renewal and scarcely a murmur against the adequacy of hardwood as a flooring material (**17**; 20.10.60).

Some 300 models, displayed by 50 firms, were on view at the second International Caravan Exhibition at Olympia, London, recently. In the last 21 years the annual production has risen from 1,500 to 45,000. Swedish Redwood, Paraná Pine, and African Mahogany are used for frames. For floors, softwood resin-bonded waterproof plywood and chipboards, and for furniture and fittings, Obeche, Paraná Pine, Ramin, light Oak, and Limba are the choice, while panelling is in hardboard and plywood with veneers or plastics (**18**; 10.12.60).

Jugoslavia. A game-breeding station at Surčin (Vojvodina) was recently honoured by a visit from a number of distinguished scientists and officials to inspect a plantation of *Rosa rugosa*. It has been found that each 100 g. of fruit contains 700–1300 mg. vitamin C, besides smaller quantities of other vitamins. The yearly fruit production per hectare, at 4000 plants/ha., is 5000 kg. The rose, a low compact shrub, is regarded as suitable for planting on land not usually exploited in forestry, e.g. between compartments, along plantation margins, or under electric transmission lines (**19**; May/June 1960).

Latin America. A focus for forest research and training in Latin America has been acquired with the permanent establishment (following 4 years on a temporary basis) of the Latin American Forestry Institute for Research and Training at the Forestry School of the University of Los Andes, Mérida, Venezuela. The Institute will carry out research projects, organize forestry training courses, gather and disseminate forestry information, and keep member governments informed on current research (**4**; 30.11.60).

Netherlands. Recently reported from Holland is a match which, it is said, will give off a pleasant odour of tobacco while burning, has a multi-coloured flame, keeps alight even in a strong wind, and stops burning just before the flame comes into contact with the user's fingers. The maker also claims that his method of manufacture—rolling, pressing and extrusion—is more economical than that used for conventional matches (**5**; 24.3.61).

New Zealand. There has been a curious interplay in New Zealand between the damage done by two introduced species—opossum and deer. The opossum concentrates on the destruction of the foliage of Rata and Kamahi, and this defoliation opens the forest floor to light, facilitating the regeneration of shrubs and trees that are palatable to deer. The deer in turn encourage the migration of the opossums by clearing the way for them: young opossums, on leaving their mothers, travel up to 10 miles, as long as the necessary tracks are provided by deer, wild cattle or goats. In the Rotoehu State Forest, the Forest Service is using poisoned jam, dyed green, to destroy opossums. It seems that the animals are attracted by this colour and that the experiment has proved a complete success (**11**; Dec. 1960).

A combination of nylon and nitrile rubber has many possibilities as a material for flexible containers, and tanks made of the two materials have been produced by Fireproof Tanks, Portsmouth, for use by the Forestry Commission of New Zealand, where there is always a problem in getting adequate water quickly to the scene of a fire. Each tank holds 250 gal. of water and can be carried on a lorry or tractor. Filling takes 1 min. 23 sec. The nylon/nitrile-rubber laminate is very strong and resistant to abrasion. It is still flexible at extremes of temperature. Containers of up to 10,000 gal. capacity are also available (**5**; 23.2.61).

South Pacific. An experimental method used at the French coconut research station at Rangiora Atoll for administering trace elements to poorly nourished coconut palms, is based on the principle employed in making blood transfusions. A stout copper nozzle, hammered into a hole drilled horizontally into the stem, is linked by a plastic tube with a container of fertilizer solution hung several feet above. The station has been set up to find practical ways of improving coconut production on the low islands of the region. The South Pacific Commission is actively assisting in its establishment and progress (**14**; Dec. 1960).

Switzerland. A new type of pylon, made of light steel tubes filled with concrete and counter-stressed by connecting wires, is so much lighter and cheaper than the traditional kind that the erection of pylons to carry high-tension cables above the forest canopy becomes possible. The only opening required is a strip ca. 1 m. wide for the hoisting of the cables, and in a section of line across a protected forest on the slopes of Mt. Rigi even this was avoided with the help of helicopters. Some of the pylons, erected on rocks and other bare spots are up to 83 m. high. They are said to be much less obtrusive and unsightly than conventional pylons (**8**; Dec. 1960).

U.S.A. Young citrus trees in Florida suffer gravely from even short exposure to temperatures only slightly below freezing. Four hours at 26° F. is enough to cause severe damage. Tests have shown that spraying a 1% water solution of maleic hydrazide on to the plants at the start of the frost-threat season throws them into temporary dormancy, enabling them to withstand lower temperatures. Maleic hydrazide has other commercial uses; it prevents growth of unwanted sucker shoots on tobacco plants; prevents sprouting in stored potatoes and onions; slows growth of grass along rights-of-way; stops strawberry plants putting out runners; reduces the number of peaches appearing on trees in Georgia, so that thinning is unnecessary and bigger and better fruit results (**10**; Oct. 1960).

The FX-Lab. Co. is offering a winter-frost protection substance in an aerosol pack. It is an emulsifiable liquid plastic which overlays shrubs and evergreen plants with a coating that protects them for a time against cold, wind, and snow damage. The preparation is milky white, drying on the plant to a clear, translucent film that prevents loss of moisture by the plant but does not stop it 'breathing'. In early spring the artificial layer splits off. The substance does not burn and can be used to advantage for coating Christmas trees, which then not only become more fire-resistant, but also last longer (**2**; 21.1.61).

An American system of plywood construction is claimed to cut out 2 of 5 steps previously used, saving time and simplifying production. The green veneer is not cured before pressing, but is put into the press in its original state with dry glue. The heat and pressure of the press cure both veneer and glue at the same time. The other step eliminated is that of sanding the surface and cutting out the defects. Instead, a plastic-impregnated paper is attached to one face of the plywood in the pressing operation. This covers the defects, eliminates the need to sand the face, and is reported to give a good base for paint without any danger of raising the grain (**5**; 24.5.61).

A new fibre-clad flakeboard is being produced by the Superwood Corp., Virginia, Minn., from fresh Aspen pulpwood with a soya-flour binder. The wood is cut into 15-in. billets, conveyed by water and by belt to a chipper feed box, where uniform (0·5 × 1·25 × 0·002-in.) flakes are chipped parallel to the natural grain, giving finally a board with a modulus of rupture of > 3000 lb./sq. in. After preparation on a single cylindrical drum, the fibre mats are placed in an unusual press consisting of 42 hollow steel platens loosely stacked within 4 corner frames and heated by gas flames directed at their hollow interior. The actual heating is achieved as the boards rise through the first few feet of the 26-ft. stack, retained heat and constant pressure effecting the proper cure during the remainder of the 42-min. cycle. The use of fibre faces is said to give uniform surfaces to the boards (mean density 40 lb./cu. ft.) and to add to their stability, rigidity, and water resistance (20; Dec. 1960).

According to a report by the Maple Flooring Manufacturers Association, the Maple flooring in a 50-year-old building was only slightly damaged when the house was destroyed by fire. Though the flooring on the 1st floor was exposed to flames from above and below, and that on the ground floor was covered with burning debris for 3 hours, most of it could be salvaged and sold. Most of the damage was by water (**16**; 15.11.60).

One of the world's largest water-cooling towers has been designed and built for the Atomic Energy Commission's National Reactor Testing Station near Idaho Falls, Ida. Capable of handling 24,000 gal./min., the tower covers an area of 100 × 65 ft., is 60 ft. high, and required 150,000 bd. ft. of Redwood timber in its construction. It was particularly important, in view of the hot, humid conditions in the tower, to provide adequate protection against soft rot and termites. This the Company's Wood Preserving Division claims to have done successfully by pressure-treating the timber with Erdalith salts which, because of their insolubility, are said to resist rapid leaching by the millions of gallons of water passing through the tower each day (**21**; Dec. 1960).

Aluminium Christmas trees have been on sale in American stores this Christmas. The trees, odourless, and with branches 'reminiscent of a crowded coat rack', have stems that can be raised to any required height. Meanwhile, a tree farmer from Rochester, Indiana, is experimenting with new methods of packaging real Christmas trees to ensure that the purchaser receives them in perfect condition. One method is to push the trees, the base of its stem first, into a long cardboard cylinder. The tree is then protected in transit and, when shaken out, resumes its former shape undamaged. Paper bags with windows have also been tried. Although the cost of the trees might be increased by as much as 60% by these methods, the protection they give might be worth it (**1**; Dec. 1960).

THE EMPIRE FORESTRY ASSOCIATION

At/THE ROYAL COMMONWEALTH SOCIETY, NORTHUMBERLAND AVENUE, LONDON, W.C.2

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1. To foster public interest in forestry.
2. To secure general recognition of the dependence of timber supply upon forest management.
3. To collect and circulate information relating to forestry and the commercial utilization of forest products.
4. To form a centre for all engaged in forestry.
5. To provide a means of communication between all concerned.

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